Policy, Research, and External Affairs

WORKING PAPERS

Trade Policy

Country Ecomonics Department
The World Bank
January 1991
WPS 566

Measuring Outward Orientation in Developing Countries

Can it Be Done?

Lant Pritchett

That alternative objective summary measures of outward orientation produce entirely different country rankings is probably not an astounding revelation. Trade regulations and barriers are generally complex legally and even more opaque in their actual administration. The hope that any reasonably straightforward summary measure could produce a "correct" ranking of countries has always been treated skeptically and — disappointingly — rightly so.

Policy, Research, and External Affairs

WORKING PAPERS

Trade Policy

WPS 566

This paper — a product of theTrade Policy Division, Country Economics Department — is part of a larger effort in PRE to examine the impact of trade policy on overall economic performance. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Karla Cabana, room N10-037, extension 37947 (52 pages).

Pritchett tries to move debate on the empirical cross-country relationship between trade policy and economic performance back one step by asking the question. Can the economists' intuitive notion of outwardly oriented policy be captured empirically? Different authors have used different measures as proxies for trade policy stances and generally have come to similar conclusions: that outwardly oriented countries perform better.

Pritchett examines the relationship between four types of empirical measures of outward orientation across countries:

- Share of trade (or imports) in GDP, adjusted for the countries' structural characteristics or factor endowments.

- The average tariff and coverage ratio of nontariff barriers (NTBs).

- Measures of the deviation of countries' actual trade pattern from the pattern predicted from a model of resource-based comparative advantage.

- A measure of real price distortions.

Pritchett finds that these promising candidates for measuring outward orientation are nearly completely unrelated in a cross-country data set. He concludes that he cannot glowingly recommend one measure over another. Nor can any of the candidates be rejected outright. The absence of correlation among them he skeptically interprets as an indictment of each. But that one (but *only* one) of the measures best captures outward orientation cannot be rejected.

He concludes that no reliable, robust estimate of the impact of general outward orientation on economic performance (economic growth or expert performance) is likely to be possible from cross-country data. This is not to say that particular variables, such as the price distortion variable, won't perform well (have a high t-statistic) in explaining cross-country variation in economic performance. But inferring that that type of empirical result is due to the effects of an outward-oriented policy stance requires additional evidence establishing a link between the measure and policies.

Large changes in the NTB coverage ratio in a particular country are more likely to indicate a movement toward import liberalization than similar differences between countries at a point in time, but those relying on the NTB coverage ratio as the key indicator of liberalization must recognize the lack of supporting evidence linking the coverage ratio to observable trade outcomes.

The administrative and legal nature of NTBs makes them an easily monitorable indicator on which to base conditionality in liberalization programs, but the generally discretionary nature of NTB implementation must be recognized, so that the removal of a particular type of legal restriction not be considered synonymous with increased outward orientation.

Data and programs are available from the author.

Produced by the PRE Dissemination Center

Measuring Outward-Orientation in LDCs: Can It Be Done?

by
Lant Pritchett*

Table of Contents

* I would like to thank Jim de Melo, Wendy Takacs, Dani Rodrik, Ed Leamer, and Bela Balassa for helpful comments. Judy Baker provided superb assistance with the data. Data and programs are available from the author.

MEASURING OUTWARD-ORIENTATION IN LDCs: CAN IT BE DONE?

The pressure for trade reform as an integral component of adjustment programs has intensified the ongoing debate about the benefits of trade liberalization of trade regimes in the less developed countries (LDCs) (Havrylyshyn 1990, Rodrik 1990). This heightened interest has in turn generated continued empirical study of the relationship between economic performance and trade policy orientation. One branch of this overall policy-performance literature uses cross-country regressions relating economic performance and a measure of policy "outward orientation" or "openness"[1] to investigate this relationship. This paper attempts to move the debate on the empirical cross-country relationship between trade policy and economic performance backwards one step by asking the question, can the economists' intuitive notion of policy outward-orientation be captured empirically?

Different authors have used different measures to proxy for trade policy stance (Edwards 1989, Dollar 1990, Balassa 1985) and generally have come to similar conclusions; namely that outward oriented countries perform better. If these different proxies for policy stance were strongly correlated this would enhance our confidence that some significant, well-understood aspect of country policy is captured by these variables representing "outward-orientation." This paper examines cross-country data for a number of variables that can plausibly claim to be a summary measure of outward

---

[1] A separate but related literature relates exports, or export performance, and economic growth (Feder 1983, Tyler 1983, Jung and Marshall 1985). However, as these studies address policy orientation at best indirectly they will not be discussed.

orientation. The empirical evidence presented below is easily summarized: the alternative objective[2] measures of outward orientation examined are completely uncorrelated across countries. This result has serious implications for empirical research that attempts to assess the effects of liberalization on economic performance using comparisons across countries and highlights the difficulties of interpretation in these type of empirical studies.

This paper is divided into four sections. The first reviews broadly and briefly some principles of the measurement of trade barriers. The second section examines the relationship between four types of empirical measures of outward orientation across countries. These are a) the share of trade (or imports) in GDP, adjusted for country structural characteristics or factors endowments, b) the average tariff and coverage ratio of non-tariff barriers (NTBs), c) measures of the deviation of countries' actual trade pattern from the pattern predicted from a model of resource based comparative advantage, and d) a measure of real price distortions. The third section discusses the interpretation and implications of the lack of association between the various measures, and the fourth concludes.

I. Measuring outward orientation in LDCs

The less developed countries (LDCs) tend to deploy a host of tariff and non-tariff barriers to imports and generally pursue policies that bias incentives against exports. Attempting a summary measure of the total impact of these barriers for a single country is a formidable project, and attempting to construct such a measure that would be comparable across countries, even

---

[2] The World Development Report 1987, developed a subjective, discrete, classification of countries by outward orientation that will not be treated.

more foreboding. Nevertheless, given the importance of the subject, measures of various kinds have been proposed.

As outlined in Baldwin (1989) there are two types of measures of trade barriers: outcome and incidence. Outcome based measures assess the deviation of the observed outcome from the outcome without the trade barriers. Outcome measures are either price based (such as effective rates of protection or assistance) or trade flow based. Incidence based measures on the other hand count the frequency of occurrences of the various types of non-tariff barriers.

Both incidence and outcome measures have limitations. Incidence, or frequency, measures of NTBs generally cannot assess the severity of the distortion imposed. Quantity, or trade flow, outcome measures are particularly sensitive to construction of the counter-factual, what would have happened in the absence of the trade barrier, which is often difficult to assess. Price outcome measures, while feasible for particular products, are extraordinarily difficult to aggregate into an economy wide summary measure.

Outward orientation is a multi-dimensional concept. One can conceptually distinguish openness from liberality. Trade liberality is the absence of government induced distortions in the flow and pattern of international trade. Liberality is not synonymous with outward orientation as countries can be outward oriented while the government plays a large role in determining economic incentives. Korea is often used as an example of an illiberal, yet outward oriented country. Similarly, openness is not synonymous with outward orientation as a country could achieve a high ratio of trade to GDP with highly interventionist policies that lead to a highly distorted pattern of trade. While intuition suggests that outward oriented

countries will tend to be simultaneously more open and more liberal, the actual relationships amongst the various components of outward orientation is an empirical question.

The next section examines six outward orientation measures: two trade flow based measures of openness, a frequency indicator of NTBs, the average tariff level, an outcome based price distortion measure, and a trade flow distortion index.

II. Comparison of Alternative Outward Orientation Measures

Empirical research into the effects of outward orientation on economic performance has generally not disentangled liberality and openness. This section examines the empirical relation between measures of openness and liberality, first by comparing two openness measures to each of three liberality measures, and secondly by examining the internal coherence of the three liberality indices is analyzed.

One difficulty in comparisons of outward orientation is that no measure has ever been proposed that is comparable both across countries and over time. Each of the cross-country measures examined here was constructed to compare countries during a different time period. However, this does not render comparisons uninteresting for two reasons. First, the measures cover roughly the same period (mid-1980s). Secondly, cross-country measures can be linked to economic performance over time only if the pattern across countries is relatively stable.

A) Trade flow based measures of openness vs. liberality

Perhaps the most obvious indicator of outward orientation is the ratio of trade to total output. Intuitively, highly protectionist policies and a large anti-export bias tend to reduce the fraction of economic activity that

is internationally traded. The obvious difficulty with openness as an outward orientation measure is that trade intensity varies across countries for reasons having nothing to do with policy and a measure of policy openness must adjust for these factors. This adjustment has been done in two ways; using structural features of the economy, or correcting for differences in factor endowments across countries.

A straightforward policy openness indicator is the magnitude of trade flows relative to GDP, corrected for certain "structural" characteristics of the Chenery-Syrquin (1975, 1988) type such as level of per capita GDP, size (both area and population), transport costs and obvious resource endowment characteristics. This measure, which I call "structure adjusted trade intensity" has been used as an outward orientation measure by Balassa (1985), among others.

Equation 1 is the basic equation that relates trade intensity and structural characteristics:

(1) Trade Intensity = $\alpha_0 + \alpha_1$ * pop'l + α_2 area + α_3 CIF/FOB + α_4 GDP per capita + α_5 (GDP per capita)^2 + α_6 oil dummy

The residuals from equation 1 can be taken as measure of outward orientation, as the residuals indicate the amount by which a countries openness exceeds or falls short of that expected of a country of its type[3]. The goodness of fit for the trade intensity regressions (R^2 of .344 for overall trade) is not bad

---

[3] This procedure is slightly incorrect as ideally the country whose openness is being measured should be excluded from the estimation of the parameters. If a separate regression is estimated excluding each country to calculate its deviation (equivalent to estimating a dummy for each country individually) the simple (rank) correlation is .95 (.99). The only countries for which the ranking is altered are those that are outliers in the independent variables. Canada (area), India (population), and Malawi (CIF/FOB ratio) are the only countries whose openness ranking changes by more than 5 places.

for cross country regressions of this type (full regression results are in Appendix 1). All variables were significant (at the 10% level) except for the CIF/FOB ratio[4] and population. The regressions give the usual results that trade intensity increases at a decreasing rate in GDP per capita (an inverse U), declines with area and increases with population. For more direct comparison with the NTB incidence and trade distortions measures, adjusted trade penetration ratios are computed for total trade (exports plus imports), total imports[5], and various import-subcategories.

The empirical importance of adjusting the simple ratio of trade to GDP to derive an outward orientation measure depends on the resultant changes in the countries' rankings by openness. Table 1 compares the correlation of the unadjusted and structure adjusted trade intensity ratios, for 1982 and 1985[6]. While the simple correlation within years is generally high (above .8), the rank correlation is relatively low. The rank correlation for total trade in 1982 (1985) was .39 (.66) which indicates that the adjustment for structural factors altered the rankings substantially. The difference in the simple and rank correlations suggests that the rankings of the most open countries are not much affected while the rankings for many countries in the middle of the

---

[4] Balassa and Noland (1988) find that if the CIF/FOB ratio is adjusted for the ratio of primary to manufactured goods in total trade is performs quite well in an openness regression for industrial countries. However, Dunn (1990) finds that although the CIF/FOB ratio is significant in gravity equations only for the industrial countries, not for the LDCs.

[5] The correlation between trade intensity (exports plus imports/GDP) and import penetration is quite high. The simple (rank) correlation before adjustment is .90 (.83), while after adjustment the correlations are .88 (.82).

[6] Data from two different years are used to facilitate comparisons with the other measures discussed below.

distribution are re-ordered[7]. However the importance of adjustment for "structural" factors is less important for LDCs than the industrial countries. For the non-oil LDCs the simple (rank) correlations of adjusted and unadjusted trade intensity in 1985 were .902 (.788). Table A.1 of the data appendix displays the actual and adjusted trade intensity ratios for the LDCs and DCs in 1985, sorted from most to least open.

Table 1: Cross country correlation of unadjusted and "structure adjusted" trade intensity ratios in 1982 and 1985.

	1982		1985	
	simple	rank	simple	rank
total	0.88	0.39	0.83	0.66
manufacturing	0.81	0.46	0.78	0.49
agriculture	0.87	0.66	0.87	0.67
resources	0.91	0.40	0.82	0.67

A major potential weakness of the structure adjusted trade intensity ratio is that the adjustment is ad hoc and atheoretic. A theoretically more sophisticated openness, or trade intensity, measure has been constructed by Leamer (1988). He creates a measure of openness from the estimation of a Heckscher-Ohlin-Vanek model of trade flows. Using data from 1982 the model predicts the net exports for each country for each of the 182 three digit SITC commodity classes as a function of the country's endowment of capital, land, labor, oil, coal, minerals the distance to its markets and the trade balance. The openness measure for total trade for a country (and the three sub-aggregates, manufacturing, agriculture, and resources) is computed as the sum

[7] If the five countries with the highest unadjusted trade intensity ratios are excluded, the simple correlations between the adjusted and unadjusted ratios fall from .88 to .37 in 1982 and from .83 to .681 in 1985.

of the deviations of the predicted from the actual level of net exports[8] across all commodities (see data appendix for details). I will call this the "endowment adjusted trade intensity ratio," or Leamer's openness measure. The structure and endowment adjusted measures of trade openness will be compared to the other outward orientation measures, however, first, the impact of the adjustment of the raw trade intensity ratios itself will be assessed.

The impact on the openness ranking of countries of the adjustment for "structure" versus the "endowment" adjustment is quite different. Table 2 shows the correlations of Leamer's openness with the unadjusted and structure adjusted trade intensity ratios. Disturbingly, Leamer's openness measure has a much higher correlation with the unadjusted than the structure adjusted trade intensity ratio. In the overall country sample[9] the rank correlation of Leamer's measure with the unadjusted trade share of GDP is .65 compared to .15 with the "structure adjusted" ratio, and the rank correlation of the two adjusted trade intensity ratios in the LDC sub-sample is only .06. The results from table 1 tell us that the adjustment of trade intensity for structural characteristics matters quite a lot in the openness ordering of countries. However, the results in table 2 indicate that another equally plausible adjustment, for factor endowments, also reorients the rankings, but in a very different way. This weak correlation should be kept in mind as

---

[8] Leamer's "intervention" indices discussed below measure the deviation of the actual from predicted trade pattern, while the "openness" index measures the deviation of the actual from predicted trade level.

[9] The sample for comparison is limited by the number of countries in Leamer's paper, although the larger sample is used in computing the trade intensity regressions. The sample used in the trade intensity regression does not affect the basic result.

these two openness measures are compared with other outward orientation measure.

Table 2: Correlation of Leamer's (1988) openness measure with unadjusted and "structure adjusted" trade intensity ratios.

	Correlation		Rank Correlation	
	unadjusted	adjusted	unadjusted	adjusted
All countries (n=45)				
total	0.75	0.36	0.65	0.15
manufacturing	0.74	0.43	0.63	0.15
agriculture	0.48	0.39	0.40	0.34
resource	0.86	0.36	0.44	0.29
LDCs only (n=29)				
total	0.77	0.32	0.52	0.06
manufacturing	0.75	0.46	0.39	0.10
agriculture	0.45	0.34	0.37	0.22
resource	0.88	0.37	0.33	0.24

The liberality measure of outward orientation to be compared to openness is constructed from data on the height of tariff barriers and frequency of NTBs for LDCs.[10] This data has been collected from country sources by UNCTAD (see UNCTAD, 1988 and Erzan, et. al., 1989). Tariffs and non-tariff barriers were collected for 89 LDCs at a detailed commodity level (SITC 5-digit). Weighted average total import charges[11] were computed for total imports and three sub-aggregates; manufacturing, agriculture, and resources using imports as weights (see the data appendix). The coverage ratio of non-tariff barriers is the world trade weighted percent of tariff code lines covered by various types of non-tariff barriers (licenses, quotas, prohibitions) as a percent of

[10] Frequency type measures of the incidence of non-tariff barriers for the industrialized countries (Nogues, Olechowski, and Winters 1986, Laird and Yeats 1988) also exist but are not comparable to the LDC data.

[11] The variable is referred to as tariffs although it includes all import charges, such as duties, customs fees, etc.

all tariff code lines within the aggregate. Overall measures that affect all imports, such as comprehensive foreign exchange licensing and general import licensing are also recorded. The data is for a single year for each country.[12] The data appear to be very carefully constructed to capture as best as possible the fraction of goods subject to nontariff import constraints and nothing in this paper should be construed as a criticism of its calculation or construction. The UNCTAD data for those countries used in the analysis is shown in the data appendix tables A.2 and A.3. The basic features of the data have been discussed elsewhere (Erzan et al, 1989) and this paper is limited to examining the relationship between the NTB coverage ratios and average tariff charges, and other outward-orientation measures.

While tariffs are often high, the predominant form of import control in LDCs is the discretionary licensing of imports. If non-tariff barriers (NTBs) and tariffs reduce the level of imports and if the NTB coverage ratios and statutory[13] tariff levels capture this effect, then NTB coverage and mean tariffs should be an empirically important determinants in reducing import penetration[14] ratios. Table 3 presents the results for just the NTB variable from cross country regressions of import penetration ratios for each of four

---

[12] The data is a rolling cross section, with each country giving the most up to date possible. The actual dates for each country range from 1985 to early 1988. Again, this raises the issue of changes over time.

[13] The tariffs are the legal levels, not amounts actually collected, which tends to be substantially lower.

[14] Import penetration ratios are used instead of total trade intensity because information is available only on barriers to and taxes on imports. However, the correlation between overall import penetration and trade intensity in 1985 was .89, so that this is not likely to be an empirically crucial difference. Also, 1985 was the latest year that trade data was generally available, while the trade barrier data more up to data. Again, this is not a major problem as the cross country correlation over time is quite high.

aggregates (total manufactures, agriculture and resources) on the NTB coverage ratio, total tariff charges, and the structural determinants of import penetration used in equation 1 for the 72 LDCs for which data was available.[15] Under each aggregate, the first column shows the standardized beta coefficient,[16] and the second column the p-level, which is the significance level of the usual t-test that the coefficient is zero.[17] The results for NTBs are easily summarized (full regression results are in Appendix 2). The estimated impact of NTB coverage on trade intensity in the full sample was nearly uniformly of the wrong sign, very small[18] and always statistically insignificant.

Figure 1 depicts the relationship between structure-adjusted total import penetration and the NTB coverage ratio for the full sample. On the vertical axis for each country is the structure adjusted trade intensity. For instance, Jordan's (JOR) import penetration is roughly 40 percentage points higher than the predicted value from the regression. One would expect that

---

[15] This procedure is nearly identical to constructing an index of openness from the residuals of the estimated equation 1 and taking the correlation with NTBs and tariffs. Using the regression approach allows separate assessment of the impact of tariff and non-tariff measures.

[16] The standardized beta scales the regression beta coefficients such that the coefficient tells how many standard deviations the dependent variable would change for a one standard deviation change in the independent variable. This is reported rather than the usual regression coefficients because the regression is in levels, and yet the independent variables are of very different scale.

[17] P-levels less than .05 indicate a rejection of the null hypothesis of no relationship. The significance levels are reported directly rather than the usual t statistics themselves to aid in interpretation. The significance level tells more clearly how far the test is from being able to reject the null hypothesis.

[18] The ratio of the variables (NTB/penetration) at the medians are: 1.10, 1.37, 9.67, 7.3 for overall, manufacturing, agriculture and resources. The elasticities for the full sample in levels at the medians therefore are: -.047, .041, .022, -.074, respectively.

Table 3: Estimated impact of non-tariff barrier coverage on import penetration in a cross country regression.

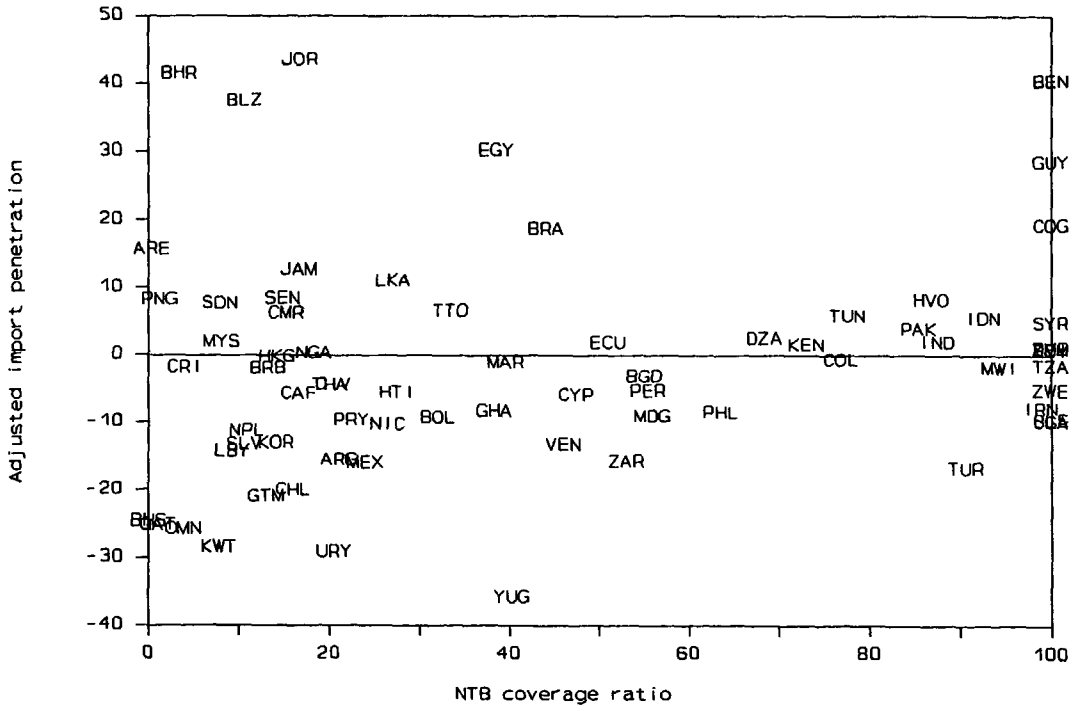
	total		manufacturing		agriculture		resource	
Sample:	std. b	sig. lvl.	std. b	sig. lvl.	std. b	sig. lvl.	std. b	sig. lvl.
full, levels	0.058	0.618	0.078	0.506	0.021	0.875	-0.039	0.746
full, logs	0.034	0.756	0.063	0.558	0.162	0.179	-0.162	0.152
w/o 3 outliers	0.077	0.533	0.022	0.851	0.031	0.819	-0.177	0.145
w/o 10 outliers	0.046	0.663	0.061	0.505	0.045	0.727	-0.122	0.268
nonoil exporters	-0.047	0.729	-0.024	0.856	0.011	0.940	-0.158	0.240
w/o general lic.	0.061	0.647	0.073	0.574	0.053	0.728	-0.071	0.619
w/o FEX or general lic.	0.012	0.926	0.033	0.793	-0.008	0.955	-0.014	0.913

the countries with low NTBs would be more open and those with high NTBs less open, producing a general downward sloping relationship. Visual inspection verifies the regression results that no clear relationship exists.

As cross country regressions are notoriously sensitive to the influence of exceptional observations, the robustness of the regression results were verified by dividing the overall sample of countries in many ways[19] and performing the same regression on these different subsets of countries. As can be seen in rows 3 to 7 of table 3, the lack of a relationship between trade intensity and NTB coverage is robust to sample selection, for all import aggregates.

[19] Besides the regressions in the table the sample was divided by income, by NTB coverage and by import penetration. NTB coverage was never significant.

Figure 1: NTB coverage and import penetration



Leamer's openness measure was regressed on mean tariffs and NTB coverage ratios for the four aggregates.[20] Table 4 presents standardized beta coefficient and p-levels for NTB coverage and mean tariffs on openness for each of the aggregates in the full and an outlier restricted sample.[21]

Examining the first two rows of table 4 it is evident that the endowment adjusted openness measure and the NTB coverage ratio are, at best, weakly

---

[20] Note that Leamer's measures deal with net exports, whereas the trade barriers cover only imports.

[21] The outlier restricted sample eliminates the ten percent of the sample with the largest (absolute value) residuals. This is done in a purely ad hoc manner to assess the importance of "unusual" countries in determining the results. In the overall imports regression the countries excluded were: Singapore, Trinidad and Tobago, and Yugoslavia.

Table 4 Relationship of Non-tariff barriers and mean total import charges to Leamer's (1988) openness measure.

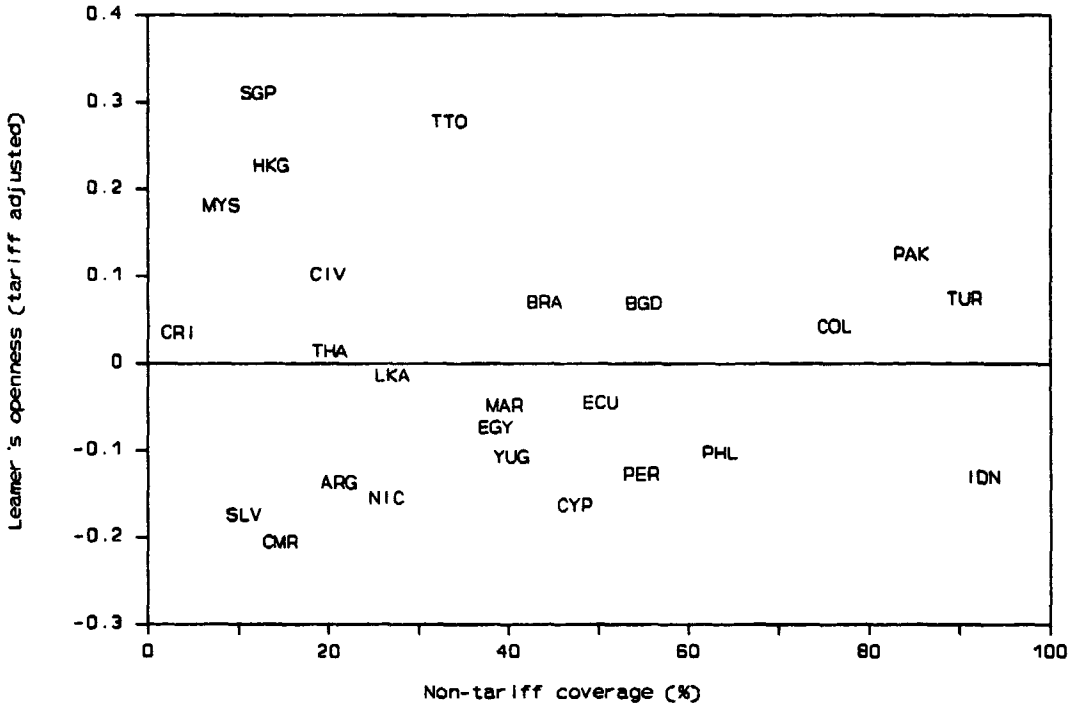
Sample:	total		manufacturing		agriculture		resource	
Non-tariff	std. b	sig. lvl.	std. b	sig. lvl.	std. b	sig. lvl.	std. b	sig. lvl.
full	-0.13	0.53	-0.09	0.67	-0.31	0.14	-0.19	0.38
restricted	-0.17	0.41	-0.00	1.00	-0.31	0.17	-0.08	0.69
Tariffs								
full	-0.53	0.01**	-0.41	0.08*	-0.25	0.21	-0.28	0.20
restricted	-0.51	0.02**	-0.47	0.05*	-0.16	0.46	-0.52	0.02**

** - significant at the 5% level
* - significant at the 10% level

correlated. While the coefficients on NTB coverage at least have the expected sign they are small and nowhere near significant for total, manufacturing or resources trade. Only agriculture is there a hint of a relationship. Figure 2 displays the plot between NTB coverage and the Leamer's HOV based openness measure. Once again, the regression results and their robustness are visually apparent. No relationship exists between NTB coverage and openness measures based either on adjusted import penetration ratios or on a more sophisticated trade intensity which adjusts for factor endowments.

While NTB coverage is completely unrelated to either openness measure, the bottom two rows of table 4 report the coefficients of mean tariffs on Leamer's openness measure. Tariff levels have a strong impact on openness overall trade, and manufactures. Table 5 reports the coefficients on mean tariffs from the structural import penetration regressions, which also provide some evidence that the level of legal tariff charges does have an impact on import penetration levels, especially with overall imports and manufactures.

Figure 2: Non-tariff barrier coverage ratio and Leamer's openness measure



Given the usual view that tariff protection is not serious in LDCs relative to NTBs and that legal tariffs are often a poor proxy for actual import charges the correlation of tariffs with openness is quite surprising.

Another potential outward orientation measure is a price outcome based liberality measure which uses the price comparisons undertaken as part of the Summers and Heston research into international comparisons of real national product (ICP). The ICP project used surveys to measure the prices of a basket of goods in a large number of countries. These detailed price comparisons were then used to construct a purchasing power parity (PPP) exchange rate used to convert local currency values into internationally comparable levels. The PPP exchange rate divided by the official exchange rate produces an

Table 5: Estimated impact of average total import charges on import penetration in cross-country regression.

	overall		manufacturing		agriculture		resource	
Sample:	std. b	sig. lvl.	std. b	sig. lvl.	std. b	sig. lvl.	std. b	sig. lvl.
full, levels	-0.290	0.053*	-0.284	0.066*	-0.212	0.170	-0.197	0.141
full, logs	-0.104	0.348	-0.173	0.125	-0.095	0.464	0.010	0.927
w/o 3 outliers	-0.257	0.106	-0.312	0.043**	-0.281	0.070*	-0.077	0.566
w/o 10 outliers	-0.378	0.007**	-0.414	0.001**	-0.244	0.108	-0.278	0.034**
nonoil exporters	-0.271	0.117	-0.309	0.081*	-0.231	0.188	-0.122	0.421
w/o general licenses	-0.255	0.150	-0.243	0.162	-0.111	0.552	-0.148	0.391
w/o FEX or general lic.	-0.175	0.183	-0.138	0.302	-0.134	0.335	-0.157	0.210

** (*) - significant at the 5 (10)% level.

internationally comparable index of price levels. If one assumes that trade restrictions result in a higher price level, all else equal, then the inverse of the price level[22] could be used as an outward orientation index. The data and country rankings by this approach are in the data appendix, table A.5.

Table 6 presents the results from the regression of overall trade on the usual variables from equation 1, plus this price based measure of outward orientation for a number of different country sub-samples.[23] The general statistical insignificance and changes in sign of the price distortion coefficient indicate that this outward orientation measure is also empirically unrelated to trade intensity. In the regression for LDCs an increase in the price level actually <u>increases</u> openness, although this result, like the others, is statistically insignificant. Figure 3 is a graph of structure

[22] Corrected for the systematic impact of level of per capita GDP.

[23] From the time series price data a measure of price variability was also constructed which was also included in the regression, with some success.

adjusted trade intensity and the price distortion measure. It is difficult to discern any pattern or relation.

Table 6: Effect of price distortion variable in trade intensity equations.

Sample	Std beta	sig level
All	-0.062	0.572
LDCs only	0.006	0.959
w/o outliers	0.043	0.695
w/o Africa	0.061	0.692
w/o HKG, SGP, IND	-0.014	0.916
Non-oil LDCs	-0.064	0.605

Leamer's openness	simple	rank
ALL	-.132	-.003
LDCs	-.014	-.051

Figure 3:Structure adjusted openness and price distortion index.

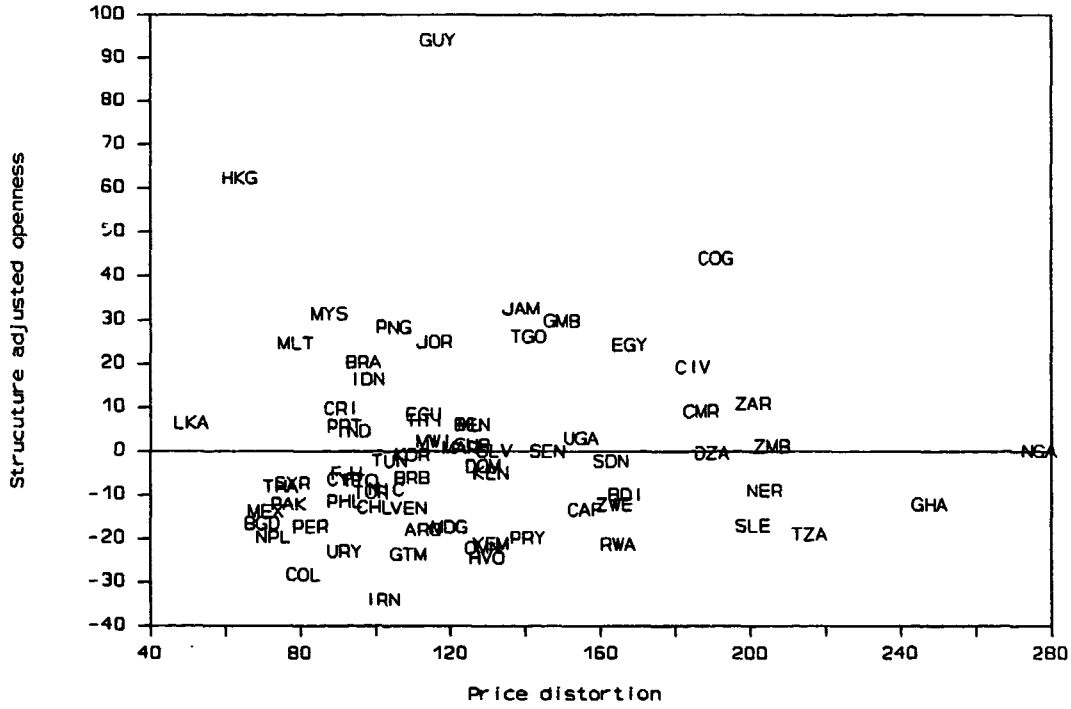


Table 7 presents the ten most and least outward oriented of 72 LDCs, as ranked by openness or price distortion. In the upper left quadrant are the ten least price distorted countries, of these seven had adjusted trade intensity below the median, and two (Nepal and Colombia) were among the ten least open. Similarly, of the top ten most outward oriented countries by trade intensity, four (Congo, Jamaica, Gambia, and Togo) were in the bottom third by the distortion measure.

Table 7: Comparisons of the ten most and least outward oriented countries of 72 LDCs, ranked by openness and price distortion.

Ten least price distorted			Ten most open		
	Ranks by:			Ranks by:	
	Dist.	Openness		Openness	Dist.
Sri Lanka	1	20	Guyana	1	38
Hong Kong	2	2	Hong Kong	2	2
Bangladesh	3	57	Congo	3	65
Mexico	4	56	Jamaica	4	50
Nepal	5	63	Malaysia	5	12
Thailand	6	44	Gambia	6	54
Pakistan	7	50	Papua New Guinea	7	28
Syria	8	43	Togo	8	51
Malta	9	10	Jordan	9	36
Colombia	10	71	Malta	10	9
Ten most price distorted			Ten least open		
Cameroon	63	17	Nepal	63	5
Algeria	64	33	Paraguay	64	52
Congo	65	3	Yemen	65	47
Sierra Leone	66	58	Rwanda	66	59
Zaire	67	15	Oman	67	45
Niger	68	46	Uruguay	68	17
Zambia	69	28	Guatemala	69	30
Tanzania	70	62	Burkina Faso	70	46
Ghana	71	51	Colombia	71	10
Nigeria	72	31	Iran	72	25

The bottom half of table 6 shows the correlation between Leamer's trade intensity measure and price distortions. While the correlation is negative as expected (higher price distortion associated with less openness) the

relationship is very weak and not statistically significant. As with NTB coverage, outward orientation measured using the unexplained deviations of country's price levels produces rankings completely unrelated to openness measured by either adjusted trade intensity ranking.

The two adjusted openness measures can also be compared to a measure of trade distortion constructed by Leamer, trade intervention indices. The difficulties of constructing an adequate measure of trade liberality based on the incidence of legal restrictions has led some to measure liberality in terms of actual trade flows.[24] E. Leamer's (1988) cross section estimation the HOV model provides measures of trade distortion for each country which compare the actual trade pattern to that predicted from the HOV factor endowment model of comparative advantage. Leamer uses the deviations of the pattern of trade from the predicted pattern to form an "intervention" index[25] for total trade as well as manufacturing, agricultural and resource aggregates (see the data appendix). This "intervention" index is a trade flow outcome based measure of trade liberality. As the appropriate normalization of the residuals (as countries with large trade would tend to have large absolute deviations) is not clear, Leamer constructed three separate indices from intervention the residuals from the estimated HOV trade model, using different weights of the same residuals. Two measures were calculated from the sum of

---

[24] A body of literature has grown up around the question of whether Japan is or is not more protectionist than other nations. Japan scores relatively low by the incidence measures, but has very low trade intensity. Saxonhouse (1985) argues that for Japan, a low import penetration ratio for manufactures simply indicates a comparative advantage in production of manufactures. Balassa and Noland (1988), on the other hand, find Japan very closed, even after accounting for endowments.

[25] This intervention index differs from the adjusted trade intensity in that both positive and negative deviations of actual trade from the prediction increase the intervention indices.

the absolute value of the residuals, scaling the total either by predicted trade or GDP. A third measure was the country R^2 (the proportion of the countries trade pattern predicted by the model)[26]. Higher levels of the trade intervention indices indicate greater distortions. Table 7 shows the results of adding these intervention indices to the basic trade intensity equation. If openness were associated with lower trade intervention then the sign of the coefficients should be negative. The only results of unambiguous statistical significance are those of the GDP weighted intervention index, which is perversely signed. The sign and significance of the intervention index scaled by predicted trade depend critically on the particular sample. The R-squared intervention measure is consistently of the expected sign, but never statistically significant.

Table 8: Impact of Leamer's intervention indices on overall trade intensity.

Intervention indices	R-squared		Trade weight		GDP weight	
ALl countries						
full	-0.12	0.47	-0.03	0.87	0.72	0.00**
w/o outliers	-0.31	0.07*	0.47	0.00**	0.83	0.00**
LDCs						
full	-0.25	0.16	-0.33	0.09*	0.73	0.00**
w/o outliers	-0.24	0.19	0.10	0.76	0.69	0.00**

This puzzling relationship between openness and intervention is also true if we compare the openness and intervention measures from Leamer's paper. Table 8 presents the correlation of Leamer's openness, or endowment adjusted trade intensity ratio, with each of the potential intervention indices. The

[26] The sign is reversed so that it is an intervention index.

openness measure is positively correlated with the intervention indices based on the absolute residuals (both GDP and total trade weighted), implying that countries that are more interventionist are also more open. Openness is very weakly negatively correlated with the R-squared measure[27].

Table 9: Correlation of Leamer's openness and intervention measures for 26 LDCs.

	Simple correlation			Rank correlation		
	gdp	trd	r2	GDP	trd	r2
Total						
All	0.69	0.67	-0.20	0.44	0.73	-0.07
LDC	0.74	0.63	-0.26	0.31	0.60	-0.21
Mfg						
All	0.82	0.75	-0.03	0.60	0.74	0.13
LDC	0.83	0.80	-0.06	0.40	0.64	-0.04
Agr						
All	0.54	0.47	-0.35	0.35	0.53	-0.32
LDC	0.58	0.58	-0.33	0.41	0.62	-0.33
Rsc						
All	0.59	0.30	-0.29	0.02	0.13	-0.25
LDC	0.63	0.26	-0.29	-0.10	0.00	-0.24

To summarize the results of the comparisons so far; two openness measures based on trade flows were compared to four potential liberality measures of outward orientation: NTB coverage, tariffs, price distortions and trade intervention indices. Although the structure and endowment adjustments to trade intensity produced significantly different indices of openness, neither of them was related in the expected way to any of the liberality measures, except for average tariffs.

[27] For the LDC sample the critical level for the correlation coefficient to reject at the 5% level the hypothesis that rho=0 is .382, which none of the correctly signed correlations achieve.

B) Comparison of the other outward orientation measures

The results of the previous section demonstrate that three potential measures of outward orientation; non-tariff barrier coverage ratios, price distortions, and Leamer's intervention indices are unrelated to trade intensity. However, if these measures were to agree amongst themselves on the ranking of countries by outward orientation this might indicate that trade intensity (however adjusted) is not an appropriate proxy for outward orientation. The next paragraphs will compare Leamer's intervention indices first to NTB coverage and mean tariffs, and then to price distortions. Finally the relation between NTB coverage and tariffs and price distortions will be explored.

Each of the Leamer intervention measures was regressed against NTB coverage and mean tariffs. One would expect that the higher the NTB coverage or the mean tariff the higher the trade intervention index. The results in table 10 go completely against that expectation. The coefficient on NTB coverage (in the top half of table 10) for total trade is consistently of the wrong sign for each of the measures, and is significant for the GDP weighted measure. The same is true of tariffs.

These negative results perhaps could be expected for three reasons. First, only 26 countries have data both on NTBs and the Leamer indices. Second, the Leamer index uses trade data from 1982 whereas the NTB and tariff data are from more recent years. Third, Leamer's indices are calculated from the prediction of net exports whereas the trade barrier data cover only imports. The hope that these different cross country indices of outward orientation would be highly correlated does not bear out.

Table 10: Relationship of Non-tariff barriers, tariffs and Leamer's intervention measures.

	Intervention index: GDP weighted		Trade weighted		R2	
	Non-tariff barrier					
	Std b	sig lvl	std b	sig lvl	std b	sig lvl
Total						
full	-0.38	0.0[illegible]**	-0.13	0.57	-0.14	0.54
w/o outliers	-0.43	0.04**	-0.18	0.46	-0.21	0.39
Manufacturing						
full	-0.37	0.06*	-0.29	0.22	0.39	0.10
w/o outliers	-0.27	0.18	-0.06	0.82	0.35	0.15
Agriculture						
full	-0.28	0.15	-0.15	0.51	-0.36	0.13
w/o outliers	-0.30	0.12	-0.11	0.64	-0.30	0.24
Resources						
full	-0.47	0.02**	-0.27	0.25	0.29	0.23
w/o outliers	-0.46	0.02**	-0.10	0.67	-0.02	0.94
Mean tariff						
Total						
full	-0.63	0.00**	-0.06	0.78	0.05	0.81
w/o outliers	-0.50	0.0[illegible]**	0.06	0.77	0.46	0.04*
Manufacturing						
full	-0.01	0.95	-0.38	0.08*	0.17	0.44
w/o outliers	-0.19	0.34	-0.26	0.25	-0.30	0.17
Agriculture						
full	-0.38	0.05**	-0.13	0.57	-0.14	0.54
w/o outliers	-0.43	0.04**	-0.18	0.46	-0.21	0.39
Resources						
full	-0.37	0.06*	-0.29	0.22	0.39	0.10
w/o outliers	-0.27	0.18	-0.06	0.82	0.35	0.15

The comparison of the price distortion measure with the Leamer intervention indices reveals the same type of conclusions. If the price distortion variable were capturing the effect of interventions that altered the pattern of trade then on would expect that a higher distortion index would be associated with a higher level of trade intervention, both indicating a lower level of outward orientation. In table 11 the simple and rank correlations for the sample of the price distortion index with each of the

intervention measures is of the wrong sign, i.e. higher intervention associated with lower price distortion. The rank correlations are slightly better in the overall sample, but are mostly perverse for LDCs considered separately.

Table 11: Correlation of Leamer's intervention indices with country price level distortion.

	simple correlation			rank correlation			
Interventions	GDP	trade	R^2	GDP	trade	R^2	# of countries
All countries	-0.07	-0.04	-0.06	0.01	0.17	0.06	44.00
Non-oil LDCs	-0.05	-0.07	-0.05	-0.15	0.11	-0.06	22.00

Table 12 lists the countries ranked from most to least outward oriented, as ranked by the price distortion measure and the rankings of those countries by the inverse of each of the Leamer intervention indices (1 is most open). The most obvious anomaly is that, while Hong Kong is ranked second by price distortion, it is consistently low on the ranking by Leamer's intervention indices. Even though the lack of internal coherence of Leamer's intervention indices makes it difficult to asses their reliability (see below) none of the indices are associated in the expected way with either administrative measures of trade barriers (NTBs and tariffs) or with price distortions.

The last two indicators of outward orientation to be compared are the price distortion index with the tariff and non-tariff barriers. If the price distortion index is capturing the effect of interventions to trade, and if that effect also is captured by the coverage ratio of non-tariff barriers or the height of tariff barriers, then one would expect that NTB coverage and mean tariffs would have a significant positive effect in explaining cross

country variation in price level. Table 13 presents the output from regressions of the price level distortions on the NTB coverage ratio and on mean tariff charges. In the full sample regressions NTBs are almost significantly positively related to price distortion, but tariffs are negatively related. The second and third rows of table 13 show that eliminating outliers improves the statistical significance of this finding. This is the opposite of the previous results for openness in which only the tariff variable was significant.

Table 12: Countries ranked least to most price distorted and by Leamer's intervention indices

	GDP	Trade	R^2
Sri Lanka	13	3	2
Hong Kong	21	22	18
Bangladesh	1	2	5
Thailand	11	15	10
Pakistan	7	18	17
Colombia	9	9	20
Peru	14	5	22
Singapore	22	7	4
Malaysia	17	21	7
Costa Rica	20	19	13
Cyprus	18	8	16
Portugal	19	16	19
Philippines	6	6	12
Fiji	2	1	1
Brazil	5	13	14
Turkey	3	17	3
Nicaragua	8	4	6
Argentina	10	14	21
Morocco	15	11	9
Dominican Republic	4	12	15
El Salvador	12	10	11
Ivory Coast	16	20	8

Even these mildly encouraging results are rather fragile however, as reasonable sorts of variations in the sample or the model will change the sign and significance of the NTB variable as well as, fortunately, the tariff variable. Three variations are especially significant because the source of the data on price distortions was Summers and Heston ICP project price levels. One variation in the sample eliminates those countries for which the data was

graded a "D" by Summer and Heston (1988), which were generally those countries for which no benchmark survey had ever been done and the price levels were pure extrapolations. This reduces the estimated impact of NTBs by half and raises the p-level to .61, well above statistical significance. Secondly, adding GDP per capita to the equation reverses the sign and eliminates the significance of the NTB variable (although tariffs are still perverse and significant). Third, either adding an African dummy variable or eliminating the African countries completely changes the results on NTBs. The sample sensitivity of the results indicates that the relationship between price level distortion and NTBs depends critically on the price level information for Africa (which tends to have the lowest GDP and highest NTBs) which is the most unreliable. In any case the promising results for NTBs are tempered by the uniformly perverse results for tariffs.

Table 13: Impact of non-tariff coverage and tariffs on price level distortion index.

	NTB		Tariffs	
	std b	sig lvl	std b	sig lvl
full	0.208	0.111	-0.221	0.092*
w/o 3 outliers	0.311	0.019**	-0.265	0.045**
w/o 10 outliers	0.325	0.020**	-0.301	0.031**
w/o S-H = D data	0.096	0.609	-0.133	0.477
w/o African	0.071	0.680	-0.193	0.265
w/ Africa dummy	-0.037	0.713	-0.122	0.206
w/ GDP per capita	-0.009	0.934	-0.240	0.028**
w/o NTB = 100	-0.045	0.782	-0.125	0.447

III. Interpretation and implications

The empirical results of this paper show that a number of promising candidates for a summary measure of outward orientation in LDCs (adjusted trade intensity, NTB coverage, tariff levels, price distortions, and trade

pattern deviation) are nearly completely unrelated in a cross-country data set. The two questions that need to be asked are: why is this so? and what are the implications for future research?

The interpretation of the validity of any of one of the particular measures of outward orientation is complicated by the fact that they are individually and collectively uncorrelated. The only thing can be asserted with any confidence is that all of the measures are not successfully measuring some country specific, time persistent, aspect of policy outward orientation. If it had been the case that several of the indicators were strongly correlated and one had disagreed with the rest, then this partial consensus would have strengthened the claims of those that agreed and indicted the loner. Unfortunately, even this partial agreement was not found. Each outward orientation measure must stand on its own merits, with the distinct possibility that none of them deserve even moderate confidence. The next paragraphs review the claims for each of the measures.

Leamer's intervention indices probably have the least intrinsic plausibility for three reasons. First, the inherent incredibility of the model used in creating the predicted pattern of trade, the deviations from which are treated as the result of policy distortions. Although the HOV model is the best game in town and Leamer is its best player, the assumptions which need to be imposed to estimate trade patterns as a function of a few crudely measured endowments and treat the residuals as indicators of trade barriers strain credibility[28]. Second, although each of the intervention indices are based on exactly the same notion of intervention, i.e. the deviation of the

---

[28] This basically agrees with Leamer's conclusion "It seems highly unlikely that these large residuals should be attributed completely to trade barriers." (Leamer 1988, pg. 189).

pattern of net exports from the model's prediction, seemingly minor details of the construction of the summary measures (such as whether the squared residuals or absolute values are used) actually make a huge difference in the country ordering (compare the rankings in table 12). Finally, the ranking by the intervention rates scaled by GDP by predicted trade are intuitively unappealing. For instance, the GDP scaled intervention rate indicates that in 1982 Singapore and Hong Kong were the most interventionist countries and Bangladesh and Turkey the least.

Using price level distortions as an outward orientation measure raises two questions, first, the validity of price level data and secondly, their interpretation as (inverse) outward orientation measures. Summers and Heston (1988) presents the results of Phase IV of the ICP project and reviews the continuing limitations of the data. The most important limitation for the comparisons in LDCs, is that to date very few of the African countries have had the benchmark survey price collection that is the basis of the ICP project. Price levels for the non-benchmark countries are extrapolated from the data of the benchmark countries. Summers and Heston grade the data reliability from A (most reliable) to D (unreliable) and all but seven of the African countries are grade D.

Even if we accept the price level data, are the country deviations from that level an adequate indicator of outward orientation? It is a fundamentally measure of the overvaluation of the currency relative to its PPP level. Although generally the support of an overvalued currency entails import controls there are other reasons for overvaluation (such as foreign aid availability[29]) than as a consequence of import controls.

---

[29] See Van Wijnbergen (1985) for empirical evidence from Africa.

The price distortion measure produces some counter-intuitive outward orientation rankings. The top five most outward oriented countries over the 1973-85 period by this measure are Sri Lanka, Hong Kong, Bangladesh, Mexico, and Nepal. Among the non-African LDCs South Korea is in the bottom third in outward orientation, ranked 33rd of 44.

The incidence frequency measures of non-tariff barriers are solid in one sense as they depend directly on legal and administrative facts. However, NTB coverage may not be an adequate indicator of openness across countries for several reasons. First, the NTB coverage ratios must aggregate together very different types of non-tariff barriers (quotas, licenses, health regulations, etc.) which may have very different impact on imports. Second, even for a single type of import barrier a coverage ratio cannot capture the variations in implementation of import policy across countries. The requirement of a discretionary import license can result in distortions of differing severity. These differences will be impossible to capture with incidence data[30].

Structure adjusted openness has two major weaknesses as an outward orientation measure. First, the overall flow of trade relative to domestic activity says nothing about the distortion of trade. For instance, a country could offset barriers to imports which protect domestic production of goods in which the country has no natural comparative advantage with subsidies to export production of goods for which the country again has no comparative advantage. This country could be simultaneously more open but more distorted than another country with completely liberal trade policies. The second

---

[30] Even if the barrier data could be augmented by administrative information (such as the percent of license applications granted) this would likely be of little help in cross country comparisons as the administrative procedures produce different incentives. For instance, some import licensing mechanisms encourage redundant applications much more than others.

problem is the atheoretic nature of the adjustment of actual openness. While the structural characteristics of size and GDP per capita are empirically important in determining trade flows, these account for only 35% of the total variation in openness across countries. It is difficult to believe that the unexplained variation is due entirely, or even primarily, to trade barriers. Finally, this measure throws up its own conundrums. Of 72 LDCs the top six most open countries in 1985 were: Singapore, Jordan, Benin, Belize, Guyana, and Brazil. Hong Kong was the 32nd most open, S. Korea 57th, and Chile the 65th.

The strength of Leamer's adjusted trade intensity ratio is that it is derived from the empirical application of a theory of the pattern of trade. The weakness is that the measure of openness inherits the defects of the theory as well as the inherent limitations in measuring the endowment of factors (such as skilled labor) which determine the trade pattern. The two major empirical concerns are that the structure adjusted and endowment adjusted trade intensity ratios are less highly correlated than either with the unadjusted, implying that the adjustments move the openness rankings in opposite directions. However, the rankings of the LDCs by openness (see data appendix table 4) are quite intuitive, with Singapore, Hong Kong and Malaysia as the most open countries and Peru, Cameroon and Argentina as the least open.

Unfortunately I cannot conclude the interpretation of the empirical results with a glowing recommendation for any particular potential measure of outward orientation against the others. Nor, given the lack of an adequate standard, can any of the candidates be rejected outright. The complete absence of correlation amongst them is skeptically interpreted as an indictment of each. However, that one (but <u>only</u> one) of the measures captures best outward orientation cannot be rejected.

B) Implications

Before focussing on the narrow issue of the implications for cross country research let me preface by saying that this paper obviously has no implications for overall conclusions on outward orientation and performance. Even accepting the validity of the notion outward orientation measures, the evidence from cross country performance regressions is the least persuasive element of the case for outward orientation. The multi-country reviews of in depth country studies such as Little, Scitovsky and Scott (1970), Krueger (1978) and Balassa (1982) are much more convincing. Secondly, the reported regression results in studies using these measures are of course not called into question, only their interpretation.

There are two principal implications of the empirical results in this paper. First, no reliable, robust estimate of the impact of general outward orientation on economic performance (i.e. economic growth or export performance) is likely to be possible from cross country data. For instance, the regressions in Edwards (1989) rely on Leamer's intervention measure in a regression explaining cross country growth. Using a measure equally valid a priori, such as Leamer's openness (adjusted trade intensity)[31], import penetration ratios or some combination of tariff and nontariff barriers data would have almost certainly produced different results. This is not to say that particular variables, such as the price distortion variable, won't perform well (i.e. have a high t-statistic) in explaining cross country

[31]As noted above the openness and intervention ratios are negatively correlated. Even more striking the correlation between the intervention measures (measures of fit of the model to a country's trade) is surprisingly low, the correlation between the intervention (the sum of the absolute values of the residuals) scaled by GDP and scaled by predicted trade only .16 and between GDP scaled intervention and R-squared (which squares the residuals) -.02 (it should be negative as a lower R2 implies a worse fit whereas a higher intervention is a worse fit) but here it is essentially zero.

variation in economic performance. However, inferring that type of empirical result is due to effects of outward oriented policy stance requires additional evidence establishing a link between the measure and policy.

Secondly, while large changes in the NTB coverage ratio in a particular country are more likely to indicate a movement towards import liberalization than similar differences between countries at a point in time, reliance on the NTB coverage ratio as the key indicator of liberalization (Laird and Nogues, 1989) needs to recognize the lack of supporting evidence linking the coverage ratio to observable trade outcomes. Potentially, even for a given country, substantial variations in coverage ratios are compatible with equal aggregate import restrictiveness. While the administrative and legal nature of NTBs makes them an easily monitorable indicator on which to base conditionality in liberalization programs, the generally discretionary nature of NTB implementation needs to be recognized, so that the removal of a particular type of legal restrictions not be considered synonymous with increased outward orientation.

The conclusion of this paper, that alternative objective summary measures of policy outward orientation produce entirely different country rankings is probably not an astounding revelation. Those who have worked on trade policy in LDCs know that trade regulations and barriers are generally complex legally and even more opaque in their actual administration. The hope that a reasonably straightforward (although not cheap or simple, as the NTB, price distortion, and Leamer's measures are the result of a massive empirical effort) measure can produce a "correct" ranking of countries has always been treated skeptically, and, disappointingly, rightly so.

Bibliography

Balassa Bela, (1967), Trade Liberalization Among Industrialized Countries: Objective and Alternatives, McGraw-Hill, New York.

Balassa, Bela, (1971), The Structure of Protection in Developing Countries, Johns Hopkins Press, Baltimore.

Balassa, Bela, (1982), "Development Strategies and Economic Performance," in Development Strategies in Semi-Industrialized Economies, London: Oxford University Press.

Balassa, Bela, (1985), "Exports, Policy Choices and Economic Growth in Developing Countries After the 1973 Oil Shock," Journal of Development Economics, May-June.

Balassa B. and Noland, M., (1988), Japan in the World Economy, Institute for International Economics.

Baldwin, R., (1989), "Measuring Nontariff Trade Policies," NBER Working Paper # 2978 (May):34-39, Cambridge, MA.

Chenery, H. and M. Syrquin, (1975), Patterns of Development, Oxford University Press.

Chenery, H. and M. Syrquin, (1989), "The Decades of Industrialization," WBER, vol 3, #2, (May).

Dollar, D. "Outward-Oriented Developing Economies Really do Grow More Rapidly: Evidence from 95 LDCs, 1976-85," mimeo.

Dunn, R., (1990) "Determinants of the Role of Foreign Trade in National Economies: An Application of the Gravity Equation," mimeo.

Erzan, R., et. al., (1989), "The Structure of Protection in the Developing Countries," UNCTAD Review, Vol. 1, #1.

Edwards, Sebastian (1989), "Openness, Outward Orientation, Trade Liberalization, and Economic Performance in Developing Countries," World Bank PPR working paper #191.

Havrylyshyn, Oleh, (1990), "The Efficiency Gains of Trade liberalization: Review of Evidence," World Bank Research Observer.

Leamer, Edward (1988), "Measures of Openness," in Robert Baldwin ed., Trade Policy Issues and Empirical Analysis, Chicago: University of Chicago Press, 147-200.

Laird, Samuel and A. Yeats (1988), "Non-tariff Barriers in Industrialized Countries: 1966-86," Finance and Development.

Laird, Samuel and Nogues, J. (1989), "Trade Policies and the Highly Indebted Countries," World Bank Economic Review, Vol. 3, 241-261.

Michaely, M., Papageorgiou, D. and Choksi, A, forthcoming Liberalizing Foreign Trade: Lessons and Experience in the Developing World.

Nogues, Julio and Olechowski, Andrezj, and Winters, Alan (1986), "The Extent of Nontariff Barriers to Industrial Countries' Imports," World Bank Economic Review, Vol 1, 181-199.

Rodrik, Dani (1990), "Closing the Technology Gap: does Trade Liberalization Really Help?," mimeo.

Saxonhouse, G., (1985), "What's Wrong with the Japanese Trade Structure?" Pacific Economic Papers, (July).

Summers, R. and Heston, A., (1989), "A New Set of International Comparisons of Real Product and Price Levels Estimates for 130 Countries, 1950-85," Review of Income and Wealth.

Taylor, L., McCarthy, F.D., and Alikhani, I. (1983), "Trade Patterns in Developing Countries, 1970-1981," World Bank Staff Working Paper #642.

UNCTAD (1988), Handbook of Trade Control Measures of Developing Countries Supplement: A Statistical Analysis of Trade Control Measures of Developing Countries, 1987. UNCTAD/DDM/Misc. 2 GE.89-55071.

UNCTAD (1988), "Protectionism and structural adjustment Part I: Restrictions to Trade," Report by UNCTAD secretariat TD/B/1160.

Van Wijnbergen, S. (1985), "Aid, Export Promotion and the Real Exchange Rate: an African Dilimma?," CPD Discussion Paper No. 1985-54, World Bank, Washington, D.C.

World Bank, (1987), World Bank Development Report, Oxford University Press.

Data Appendix

The data appendix describes the source and methods for the data used in the paper.

A) Tariffs and non-tariff barriers.

The information for each country on the tariffs and non-tariff barriers to trade was taken from country pages in the UNCTAD (1988) publication. For each country the trade weighted averages of total charges and frequency of non-tariff measures for food (SITC 0+1+22+4), agricultural raw materials (SITC 2 less 22,27,28), crude fertilizers (SITC 27+28), mineral fuels (SITC 3), non-ferrous metals (SITC 68) and manufactures (SITC 5 through 8 less 68) were entered. Weighted averages for Agriculture and Resources categories were formed from the sub-aggregates reported using the 1985 world trade weights. Data appendix tables 1 and 2 present the raw data, sorted by overall trade barriers.

B) Leamer's measures of openness

Measures of openness and trade intervention for each of the four aggregates: overall, manufactures (SITC 51 to 96, less 63,64,68,94), agriculture (SITC 1-26,29,41-43), and resources (SITC 27,28,32 to 35 and 68) were taken from Leamer (1988). The estimates used were from the model estimated after scaling by GDP which tends to fit the smaller LDC countries better[32]. The openness measure is from Table 6.8: Openness measures: adjusted trade intensity ratios, regression model; Table 6.10: Country R2, regression model; Table 6.11: Intervention rates, regression model, scaled by GNP; Table 6.12: Intervention rates, regression model, scaled by predicted trade. The formulas for the various measures for the ith country are: E_{ij} is the residual (actual minus predicted) of the net exports of the j^{th} commodity for the i^{th} country. Adjusted trade intensity is $\Sigma_j E_{ij}/GDP_i$. GDP weighted intervention is $\Sigma_j |E_{ij}|/GDP_i$, predicted trade $\Sigma_j |E_{ij}|/N_i^*$, where N_i^* is predicted trade. The R^2 for each country is $\Sigma_j E_{ij}^2/GDP_i / \Sigma_j (T_{ij}-T_i$, where T_{ij} is actual trade.

C) Import penetration ratios.

Trade intensity and import penetration ratios were calculated using data on imports in US$ for 1982 and 1985 (the latest year with generally available data) from the UNSO trade data base, accessed using the World Bank's TARS system. The aggregates were overall, manufacturing (SITC 5 to 8 less 68), agriculture (SITC 0+1+2+4, less 27,28) and resources (SITC 27+28+3+68). The ratios of trade to GDP were calculated using dollar GDP data from the National Accounts (NA) database maintained by the World Bank, accessed through BESD. The structure adjusted intensity data are in table 3.

D) Price distortion index

Summers-Heston (1988) reported on data from the International Comparisons Project (ICP). The ICP has collected detailed price observations from a large number of countries to construct price

---

[32] As Leamer says (p 186) "it is best to think of ...the scaled model as describing the smaller countries."

levels in a common currency. A measure of price distortion was built in Dollar (1990) from this data, estimating the price level as a function of GDP per capita and regional dummy variables and using deviations from this norm as a distortion index. The raw data, sorted from least to most distorted, is in table 5.

E) Other variables

The data on land area and population were taken from the World Bank's Social Indicators database through BESD. The data on the CIF/FOB margin were taken from the IMF's IFS. GDP per capita in 1985 was taken from Summers and Heston 1985, along with the grade for the data. Oil exporters are those with greater than 30% of oil exports, taken from the World Development Report, 1988.

Data appendix, table A.1: Structure adjusted trade intensity ratios, 1985, by rank, LDCs and industrial countries.

	Overall		Manuf.		Agric.		Resources		Unadjusted
	%	R	%	R	%	R	%	R	%
LDC's									
Singapore	145.9	1	71.6	1	17.5	4	48.7	1	252.4
Guyana	80.7	2	15.8	11	17.8	3	44.8	2	126.7
Baharain	69.1	4	21.3	6	2.7	26	44.7	3	153.0
Congo, People'e Rep.	54.6	6	20.1	8	0.5	35	33.8	4	83.4
Gambia	36.1	7	16.7	10	22.6	2	-2.7	50	74.4
Togo	35.5	8	14.5	12	6.7	13	14.3	9	73.0
Hong Kong	34.8	9	55.4	2	-0.2	39	-19.2	92	139.2
Papua New Guinea	28.9	11	2.1	29	10.3	7	10.2	13	74.8
Jordan	27.2	12	11.6	16	2.1	28	9.8	14	83.4
Jamaica	27.2	13	2.1	30	3.1	24	22.6	5	79.4
Ivory Coast	26.8	14	0.8	34	24.2	1	2.0	25	67.9
Malaysia	24.1	16	5.2	25	9.5	8	10.5	12	91.3
Egypt	22.5	17	20.8	7	7.6	11	-6.3	73	44.3
Cameroon	20.6	18	11.3	17	4.7	19	4.1	19	45.5
Indonesia	19.7	19	14.3	13	2.0	29	2.8	23	32.8
India	18.6	20	7.7	24	4.8	16	5.9	17	11.5
Malta	14.0	21	23.5	5	-1.5	47	-8.0	78	99.2
Benin	13.0	22	9.4	21	1.6	31	2.6	24	50.6
Mali	12.4	23	10.2	19	4.8	17	-2.7	48	42.1
Zaire	11.5	24	4.7	27	-5.9	79	11.7	10	32.6
Algeria	9.6	25	8.3	23	0.1	37	1.0	26	36.0
Malawi	8.0	26	5.1	26	7.5	12	-4.0	56	44.0
Nigeria	7.9	27	10.0	20	-3.2	60	0.3	27	20.6
Zambia	5.6	28	0.4	36	-11.5	93	17.0	7	40.5
Senegal	4.6	29	-0.9	44	6.1	14	-0.2	31	44.5
Haiti	3.6	30	13.3	14	-5.1	73	-5.0	65	42.9
Kenya	3.2	31	-0.0	39	0.4	36	3.4	20	38.6
Ecuador	3.0	32	0.0	38	3.6	22	-0.5	32	43.2
Korea, Rep. of	0.9	34	12.5	15	-7.5	89	-2.7	49	64.8
Costa Rica	0.2	35	1.1	31	10.4	6	-10.8	88	62.0
Sri Lanka	-0.1	36	-2.3	50	4.1	20	-1.0	38	49.2
Niger	-1.6	38	11.2	18	-7.2	88	-5.1	66	28.8
Brazil	-2.0	39	-1.3	46	0.6	34	-0.8	37	17.2
Morocco	-2.1	40	-0.8	43	-0.9	42	-0.5	33	44.7
Sudan	-2.9	41	1.0	32	0.7	33	-4.2	57	21.9
Portugal	-4.9	43	-0.7	41	-0.9	43	-2.2	43	66.6
Tunisia	-5.0	44	-0.7	42	-6.4	83	3.1	22	49.8
Zimbabwe	-5.8	45	-2.3	49	-2.8	56	-0.7	35	35.4
Suriname	-6.0	46	-22.8	88	-2.1	53	19.5	6	63.7
Central African Rep.	-6.8	47	0.6	35	-1.3	46	-5.6	70	27.1
Burundi	-7.0	48	-1.2	45	-1.9	51	-3.7	55	28.8
Madagascar	-10.2	50	-3.0	53	-3.5	61	-3.0	51	24.5
Dominican Republic	-10.4	52	-0.6	40	-1.9	52	-9.4	85	41.8
Thailand	-10.4	53	-5.7	60	-1.3	45	-3.3	53	39.2
Uganda	-10.4	54	-7.3	64	1.9	30	-4.5	61	23.9

Data appendix, table A.1: Structure adjusted trade intensity ratios, 1985, by rank, LDCs and industrial countries (cont.)

	Overall		Manuf.		Agric.		Resources		Unadjusted
	%	R	%	R	%	R	%	R	%
Fiji	-11.2	55	-12.8	76	4.8	18	-4.4	60	53.2
Pakistan	-11.6	56	-3.7	55	-4.7	70	-2.5	46	26.2
Bangladesh	-12.2	57	-2.9	52	-5.1	72	-3.6	54	22.8
Ghana	-12.4	59	-4.7	58	-2.8	57	-4.3	59	22.0
Syran Arab Rep.	-12.4	60	-4.1	56	-0.9	41	-7.4	75	33.3
Venezuela	-12.6	61	-7.6	67	-3.9	64	-0.7	36	35.4
Philippines	-13.0	62	-11.5	74	-6.0	80	-2.3	44	31.5
El Salvador	-13.0	63	-7.6	65	3.8	21	-8.7	81	33.1
Barbados	-14.8	64	-1.6	48	-3.0	59	-9.2	83	69.5
Tanzania	-15.1	65	-3.1	54	-7.0	85	-4.7	63	15.4
Burkina Faso	-15.3	66	-4.5	57	-6.4	82	-4.5	62	19.5
Cyprus	-16.4	68	-7.6	66	-0.1	38	-7.3	74	68.7
Nepal	-16.6	69	-1.5	47	-9.0	92	-5.3	68	20.3
Sierra Leone	-16.6	70	-5.3	59	-8.0	91	-3.1	52	20.2
Rwanda	-18.9	73	-7.7	68	-5.1	71	-5.6	71	16.8
Turkey	-19.2	75	-9.2	72	-6.7	84	-2.1	42	35.7
Yemen, Arab Rep. of	-21.2	77	-6.7	62	-6.1	81	-7.6	77	21.3
Mexico	-23.0	78	-6.5	61	-2.6	55	-14.1	90	20.9
United Arab Emirates	-23.0	79	-26.4	92	-2.9	58	7.2	15	68.1
Trinidad & Tobago	-23.1	80	-16.8	83	-1.0	44	-4.3	58	54.5
Peru	-24.7	81	-16.5	82	-7.6	90	0.2	28	24.5
Paraguay	-27.2	82	-14.1	78	-3.5	62	-8.7	80	25.9
Chile	-27.8	84	-23.0	89	-4.1	66	0.1	29	38.0
Guatemala	-29.1	85	-16.2	81	-4.7	69	-7.6	76	21.1
Nicaragua	-30.3	86	-17.4	85	-1.5	48	-10.6	87	24.2
Iran	-33.9	87	-14.6	79	-4.4	67	-14.7	91	12.5
Colombia	-34.5	88	-20.0	86	-5.4	77	-8.2	79	20.1
Argentina	-35.9	89	-23.1	90	-2.3	54	-9.2	84	18.8
Kuwait	-37.7	90	-22.2	87	-1.6	50	-13.1	89	49.5
Uruguay	-38.0	91	-23.3	91	-3.6	63	-9.6	86	30.9
Oman	-43.4	93	-10.8	73	-1.6	49	-31.2	93	37.6
Industrial countries									
Ireland	70.9	3	47.6	3	12.3	5	7.1	16	118.4
Belgium	62.5	5	40.6	4	6.1	15	10.9	11	132.0
Netherlands, The	30.9	10	9.0	22	8.4	9	14.3	8	98.4
Canada	24.9	15	17.9	9	3.0	25	3.3	21	45.6
Norway	2.0	33	2.8	28	1.0	32	-1.7	40	55.4
United States	-0.8	37	-2.5	51	2.7	27	-1.1	39	14.1
Australia	-3.0	42	-7.8	69	-0.5	40	5.1	18	24.6
Sweden	-8.7	49	0.4	37	-5.3	75	-2.6	47	59.2
New Zealand	-10.3	51	-15.1	80	7.7	10	-2.5	45	52.5
Denmark	-12.2	58	-8.6	71	3.3	23	-5.8	72	59.6
Switzerland	-16.1	67	0.9	33	-7.0	87	-8.8	82	55.3
Finland	-17.0	71	-8.3	70	-5.3	76	-2.1	41	49.8
Germany, Federal Rep.	-17.1	72	-6.8	63	-4.6	68	-5.4	69	51.1

Data appendix, table A.1: Structure adjusted trade intensity ratios, 1985, by rank, LDCs and industrial countries (cont.)

	Overall		Manuf.		Agric.		Resources		Unadjusted
	%	R	%	R	%	R	%	R	%
Italy	-19.2	74	-13.6	77	-5.2	74	0.1	30	38.5
United Kingdom	-19.4	76	-12.6	75	-5.5	78	-0.7	34	43.9
France	-27.3	83	-17.2	84	-3.9	65	-4.8	64	38.2
Japan	-40.0	92	-26.8	93	-7.0	86	-5.1	67	22.5

Data appendix, table A.2: UNCTAD data on NTB frequency, by major aggregate, the indicator for overall foreign exchange licensing,

	Overall		Manuf.		Agric.		Resources		
	Ratio	R	Ratio	R	Ratio	R	Ratio	R	FEX
Bahamas	0.1	1	0.1	2	0.0	1	0.0	5	1
United Arab EM	0.5	2	0.3	3	1.5	4	0.1	9	0
Qatar	1.2	3	1.2	4	1.5	5	0.0	1	0
Papua New Guinea	1.3	4	0.0	1	7.2	10	0.0	3	0
Bahrain	3.5	5	4.6	7	1.8	6	0.0	6	0
Oman	4.0	6	5.2	9	1.5	3	0.1	14	0
Costa Rica	4.1	7	6.0	11	0.0	2	0.0	2	1
Kuwait	7.9	8	7.2	14	15.1	18	0.3	19	0
Sudan	8.0	9	8.4	16	12.2	14	0.0	7	0
Malaysia	8.2	10	9.1	19	11.3	13	0.2	16	0
Saudi Arabia	8.4	11	8.8	18	14.4	17	0.1	11	0
Libya	9.4	12	10.0	23	14.3	16	0.0	8	1
Solomon Isld	10.7	13	11.3	25	16.3	20	0.2	17	1
Belize	10.7	14	5.9	10	37.0	32	0.7	20	1
Nepal	11.0	15	14.1	31	6.5	9	0.1	10	0
Singapore	12.9	16	12.8	29	19.7	23	3.9	23	0
Somalia	13.0	17	5.0	8	4.1	8	58.9	36	0
Guatemala	13.1	18	10.6	24	32.2	30	0.3	18	0
Barbados	13.3	19	11.4	26	26.0	27	6.0	25	0
Korea RP	14.2	20	14.6	32	24.3	26	0.1	15	0
Hong Kong	14.3	21	3.3	5	9.0	12	73.4	42	0
Senegal	14.9	22	8.5	17	28.5	28	26.9	32	0
Cameroon	15.3	23	17.9	35	16.0	19	1.1	22	0
Grenada	15.8	24	9.5	20	50.5	39	0.0	4	0
Chile	16.1	25	6.5	12	12.3	15	67.6	38	0
Central African Re	16.7	26	4.0	6	16.4	21	76.5	44	0
Jamaica	16.7	27	13.9	30	39.9	34	0.1	13	0
Jordan	16.8	28	7.1	13	66.5	45	0.1	12	0
Nigeria	18.4	29	12.4	28	46.1	36	12.6	28	0
Thailand	20.2	30	16.3	33	36.8	31	18.0	31	0
Ivory Coast	20.6	31	9.9	22	18.5	22	73.9	43	0
Uruguay	20.6	32	11.7	27	3.4	7	83.9	49	0
Argentina	21.2	33	28.4	40	8.4	11	1.1	21	0
Paraguay	22.5	34	8.4	15	32.1	29	77.0	45	1
Mexico	24.1	35	9.9	21	39.7	33	72.4	41	0
Sri Lanka	27.1	36	17.3	34	22.5	25	77.3	46	0
Haiti	27.6	37	26.2	37	43.4	35	16.5	30	0
Trinidad & Tobago	33.5	38	27.4	38	48.7	38	42.0	33	0
Ghana	38.4	39	33.5	41	83.7	54	5.8	24	0
Egypt	38.6	40	35.4	42	46.4	37	42.8	35	0
Morocco	39.7	41	23.0	36	66.7	46	84.4	50	1
Yugoslavia	40.4	42	27.7	39	68.0	47	69.1	39	1
Brazil	44.1	43	41.0	45	22.4	24	84.7	51	0
Venezuela	46.1	44	47.8	48	69.8	48	6.3	26	1
Cyprus	47.5	45	39.8	43	62.7	42	65.4	37	0

Data appendix, table A.2: UNCTAD data on NTB frequency, by major aggregate, and Indicator for overall foreign exchange licensing (cont.)

	Overall		Manuf.		Agric		Resources		
	Ratio	R	Ratio	R	Ratio	R	Ratio	R	FEX
Ecuador	51.0	46	51.2	49	79.7	51	14.5	29	0
Zaire	53.1	47	46.2	47	55.0	40	86.0	53	0
Bangladesh	55.1	48	43.6	46	72.6	49	88.5	55	0
Peru	55.5	49	40.8	44	89.4	58	85.3	52	1
Madagascar	56.0	50	63.4	51	63.7	43	8.9	27	1
Philippines	63.6	51	69.5	52	55.8	41	42.7	34	0
Algeria	68.4	52	60.1	50	86.6	56	87.4	54	0
Kenya	73.0	53	69.8	53	81.4	52	77.6	47	0
Colombia	76.9	54	72.6	55	81.6	53	89.6	56	0
Tunisia	77.6	55	71.7	54	84.0	55	94.1	58	0
Pakistan	85.4	56	81.6	56	91.1	59	96.8	59	0
Burkina Faso	86.8	57	91.1	59	66.4	44	93.4	57	0
India	87.4	58	83.1	57	94.4	61	99.4	60	0
Turkey	90.6	59	97.8	60	79.7	50	70.2	40	0
Indonesia	92.5	60	89.8	58	96.2	62	100.0	61	0
Malawi	94.4	61	98.5	61	88.0	57	83.2	48	0
Iran	98.8	62	98.6	62	94.2	60	100.0	73	0
Syria Arab RP	100.0	63	100.0	63	100.0	63	100.0	62	0
Sierra Leone	100.0	64	100.0	64	100.0	64	100.0	63	1
Guyana	100.0	65	100.0	65	100.0	65	100.0	64	0
China	100.0	66	100.0	66	100.0	66	100.0	65	1
Burundi	100.0	67	100.0	67	100.0	67	100.0	66	0
Mozambique	100.0	68	100.0	68	100.0	68	100.0	67	0
Zimbabwe	100.0	69	100.0	69	100.0	69	100.0	68	1
Zambia	100.0	70	100.0	70	100.0	70	100.0	69	0
Yemen	100.0	71	100.0	71	100.0	71	100.0	70	0
Uganda	100.0	72	100.0	72	100.0	72	100.0	71	0
Tanzania	100.0	73	100.0	73	100.0	73	100.0	72	0
Congo	100.0	74	100.0	74	100.0	74	100.0	74	0
Benin	100.0	75	100.0	75	100.0	75	100.0	75	0

Data appendix, table A.3: UNCTAD data on mean total import charges by major aggregate, in percent and rank

	Overall		Manuf.		Agric.		Resources	
	%	R	%	R	%	R	%	R
Singapore	1.2	1	1.4	1	0.0	2	1.8	3
Oman	2.1	2	2.4	2	1.7	5	1.3	2
Hong Kong	2.5	3	3.7	3	0.0	1	0.0	1
Saudi Arabia	3.7	4	4.1	6	1.4	3	4.4	10
Qatar	4.3	5	4.0	5	5.4	7	4.0	7
United Arab EM	4.3	6	4.7	7	1.5	4	5.9	13
Kuwait	6.5	7	3.9	4	2.1	6	23.1	48
Bahrain	7.2	8	7.6	8	7.6	8	5.0	12
Yugoslavia	11.3	9	13.1	9	8.4	9	6.0	14
Papua New Guinea	13.1	10	13.8	10	11.2	15	10.3	28
Mexico	13.4	11	16.0	13	10.4	14	4.3	9
Haiti	14.6	12	14.3	11	23.3	32	4.9	11
Malaysia	15.0	13	18.2	16	8.5	10	3.7	6
Solomon Isld	15.8	14	15.7	12	20.7	28	9.9	25
Barbados	16.2	15	19.0	17	9.1	11	6.9	16
Guyana	16.4	16	19.3	18	9.3	12	7.0	18
Jamaica	16.7	17	19.7	22	9.8	13	6.9	17
Guatemala	17.3	18	16.5	14	21.2	29	10.2	27
Uganda	18.1	19	17.7	15	27.8	40	8.3	22
Zaire	18.2	20	19.6	19	18.9	25	7.2	20
Algeria	18.2	21	22.1	27	15.5	20	2.4	5
Indonesia	18.4	22	22.0	26	16.3	22	4.1	8
Malawi	19.1	23	21.7	25	16.1	21	7.2	19
Cyprus	19.9	24	23.9	28	13.7	17	7.5	21
Chile	20.2	25	19.7	21	22.4	31	20.0	41
Yemen	20.5	26	19.7	20	24.5	37	19.5	40
Nigeria	20.5	27	21.0	23	32.4	52	10.7	29
Nepal	20.8	28	25.4	35	11.8	16	2.2	4
Zimbabwe	20.8	29	21.2	24	22.3	30	22.4	46
Sierra Leone	21.8	30	25.1	32	14.7	19	21.0	44
Belize	22.2	31	25.2	34	14.6	18	12.9	32
Korea RP	22.7	32	25.0	31	23.7	34	10.2	26
Ivory Coast	22.9	33	24.6	30	17.2	24	21.0	43
Syria Arab RP	24.5	34	25.2	33	23.4	33	22.8	47
Mozambique	24.5	35	24.0	29	28.9	44	23.6	49
Somalia	24.8	36	25.5	36	36.3	56	6.9	15
Zambia	25.8	37	26.1	37	29.8	47	19.3	39
Grenada	25.9	38	29.2	41	20.1	27	15.3	35
Jordan	27.1	39	32.2	48	16.3	23	12.4	31
Tunisia	27.5	40	28.0	40	27.8	42	10.7	30
Uruguay	27.6	41	27.8	39	24.3	36	30.5	59
Congo	28.7	42	30.5	43	24.2	35	24.3	50
Philippines	29.8	43	30.8	44	31.2	50	22.1	45
Senegal	29.9	44	30.5	42	29.7	45	26.8	55
Burundi	30.9	45	27.4	38	52.4	64	15.3	36

Data appendix, table A.3: UNCTAD data on mean total tariff charges by major aggregate, in percent and rank (cont.)

	Overall		Manuf.		Agric.		Resources	
	%	R	%	R	%	R	%	R
Ghana	31.0	46	31.0	45	30.4	48	32.8	61
Venezuela	31.4	47	31.0	46	34.7	53	25.5	53
China	32.1	48	37.1	54	30.6	49	9.2	24
Bahamas	33.1	49	34.8	50	27.7	39	29.4	58
Central African Re	33.7	50	36.9	53	27.0	38	24.7	51
Morocco	34.6	51	35.1	51	29.8	46	37.5	67
Tanzania	35.0	52	35.1	52	34.8	54	35.6	66
Sri Lanka	35.4	53	31.3	47	44.4	60	44.6	69
Madagascar	35.6	54	37.2	55	45.4	61	16.5	38
Libya	36.5	55	38.4	56	19.5	26	54.4	71
Thailand	36.9	56	40.4	58	36.7	57	13.2	33
Kenya	36.9	57	39.0	57	35.0	55	13.4	34
Cameroon	37.0	58	40.6	59	27.8	41	28.2	56
Costa Rica	37.2	59	33.3	49	55.1	66	32.6	60
Argentina	38.6	60	41.2	60	32.3	51	33.9	64
Ecuador	39.1	61	42.9	62	48.4	62	8.8	23
Egypt	41.4	62	42.6	61	57.3	68	16.0	37
Trinidad & Tobago	41.6	63	45.9	64	27.9	43	33.9	63
Benin	42.2	64	44.7	63	38.9	59	32.9	62
Turkey	44.8	65	46.9	65	37.3	58	26.7	54
Sudan	47.0	66	49.4	66	54.6	65	25.5	52
Peru	56.1	67	63.7	68	48.5	63	29.2	57
Paraguay	63.6	68	58.7	67	72.9	73	77.0	74
Bangladesh	67.1	69	72.8	70	56.9	67	40.6	68
Burkina Faso	67.5	70	67.6	69	69.6	72	63.1	73
Pakistan	68.5	71	78.3	72	58.3	69	35.4	65
Iran	70.1	72	80.4	74	69.2	70	20.4	42
Colombia	73.7	73	77.0	71	74.2	74	56.5	72
Brazil	75.2	74	78.5	73	69.6	71	47.5	70
India	140.0	75	149.4	75	125.8	75	109.4	75

Data appendix, table A.4: The rank of the various trade openness measures from Leamer (1988) for each of the aggregates.

	Overall				Manufacturing				Agriculture				Resources			
	OP	IG	IT	R^2	OP	IG	IT	R^2	OP	IG	IT	R^2	OP	IG	IT	R^2
Singapore	1	26	10	6	2	25	12	5	17	21	10	16	1	26	14	9
Hong Kong	2	25	26	23	1	26	26	22	4	16	26	14	20	24	25	23
Malaysia	3	21	24	9	4	20	23	11	1	25	25	8	3	16	11	5
Trin & Tob	4	23	25	19	3	23	21	12	10	10	19	20	2	25	26	19
Ivory Coast	5	20	23	10	5	21	25	23	2	24	12	1	5	19	23	21
Turkey	6	2	19	5	8	7	19	15	7	6	24	15	7	3	4	3
Costa Rica	7	24	21	18	9	22	17	17	3	26	17	4	22	23	22	22
Yugoslavia	8	8	22	14	6	14	24	19	11	2	20	21	12	12	16	16
Thailand	9	15	17	15	16	13	15	21	5	19	22	11	8	4	7	12
Sri Lanka	10	17	5	4	11	12	5	3	8	22	9	3	10	6	3	2
Indonesia	11	7	4	3	18	5	3	4	13	3	13	13	4	21	6	7
Morocco	12	19	13	12	15	19	13	20	9	20	21	19	9	17	12	11
Pakistan	13	9	20	22	7	11	20	18	18	12	18	17	18	8	15	20
Ecuador	14	3	18	2	13	8	18	7	6	5	23	6	24	7	5	6
Philippines	15	6	9	17	12	6	11	14	16	7	15	18	21	13	8	14
Nicaragua	16	10	6	8	21	16	8	9	15	17	3	5	13	2	2	4
Solom. Isld	17	13	14	16	25	17	14	24	12	15	16	12	6	11	20	13
Cyprus	18	22	11	21	17	24	9	8	20	23	14	23	16	20	19	18
Bangladesh	19	1	2	7	20	1	1	2	19	1	1	2	15	1	10	8
Sau.Arab.	20	5	1	1	10	3	2	1	22	4	4	24	23	14	1	1
Egypt	21	12	7	11	24	15	6	10	14	14	8	9	11	10	17	15
Brazil	22	4	15	20	19	2	22	26	24	9	11	26	19	5	9	10
Argentina	23	16	16	25	23	10	16	25	23	18	6	22	14	9	24	24
Colombia	24	11	12	24	14	4	10	6	21	13	7	7	25	18	21	26
Cameroon	25	14	3	13	26	18	4	16	26	11	2	10	17	15	13	17
Peru	26	18	8	26	22	9	7	13	25	8	5	25	26	22	18	25

Note: Sorted for each measure such that a lower number indicates greater liberality.

Data appendix, table A.5: Price distortion and variability measures, from Dollar (1990).

LDCs	Price distortion	Variability
Sri Lanka	51.000	0.140
Hong Kong	64.000	0.160
Bangladesh	70.000	0.110
Mexico	71.000	0.120
Nepal	73.000	0.130
Thailand	75.000	0.070
Pakistan	77.000	0.090
Syrian Arab Rep.	78.000	0.170
Malta	79.000	0.040
Colombia	81.000	0.070
Peru	83.000	0.130
Singapore	87.000	0.100
Malaysia	88.000	0.080
Costa Rica	91.000	0.170
Philippines	92.000	0.130
Portugal	92.000	0.090
Cyprus	92.000	0.100
Uruguay	92.000	0.170
Fiji	93.000	0.100
India	94.000	0.130
Trinidad & Tobago	96.000	0.220
Brazil	97.000	0.130
Indonesia	98.000	0.150
Turkey	99.000	0.130
Chile	100.000	0.110
Iran	102.000	0.190
Nicaragua	103.000	0.410
Tunisia	104.000	0.110
Papua New Guinea	105.000	0.090
Venezuela	109.000	0.230
Guatemala	109.000	0.270
Korea	110.000	0.040
Barbados	110.000	0.130
Argentina	113.000	0.230
Ecuador	113.000	0.190
Haiti	114.000	0.270
Jordan	116.000	0.070
Malawi	116.000	0.150
Guyana	117.000	0.350
Madagascar	120.000	0.080
Morocco	123.000	0.110
Lesotho	126.000	0.150
Suriname	126.000	0.130
Benin	126.000	0.080
Mali	127.000	0.090
Dominican Republic	129.000	0.190
Oman	129.000	0.210
Burkina Faso	130.000	0.060

Data appendix, table A.5: Price distortion and variability measures, from

Dollar (1990) (continued).

LDCs (cont.)	Price distortion	Variability
Yemen	131.000	0.200
Kenya	131.000	0.040
El Salvador	132.000	0.440
Jamaica	139.000	0.190
Paraguay	141.000	0.210
Togo	141.000	0.040
Senegal	146.000	0.090
Gambia, The	150.000	0.080
Uganda	155.000	0.500
Central African Rep.	156.000	0.090
Sudan	163.000	0.160
Zimbabwe	164.000	0.060
Rwanda	165.000	0.240
Burundi	167.000	0.200
Egypt	168.000	0.270
Angola	172.000	0.270
Bolivia	181.000	0.460
Ivory Coast	185.000	0.060
Cameroon	187.000	0.060
Algeria	190.000	0.110
Guinea	190.000	0.190
Congo	191.000	0.080
Sierra Leone	201.000	0.250
Zaire	201.000	0.220
Niger	204.000	0.050
Zambia	206.000	0.120
Tanzania	216.000	0.170
Ghana	248.000	0.280
Nigeria	277.000	0.310
Industrial market		
Canada	83.000	0.080
United States	90.000	0.060
Italy	92.000	0.060
France	98.000	0.113
United Kingdom	99.000	0.110
Belgium	100.000	0.190
New Zealand	101.000	0.070
Netherlands, The	105.000	0.130
Norway	107.000	0.110
Germany, Fed. Rep.	109.000	0.150
Denmark	112.000	0.150
Japan	118.000	0.098
Ireland	119.000	0.050
Finland	126.000	0.080
Switzerland	127.000	0.100
Australia	129.000	0.050
Sweden	142.000	0.140

Appendix 1: Trade intensity regression results

Overall trade

Valid cases:	93	Dependent variable:	X+M/GDP
Missing cases:	0	Deletion method:	None
Total SS:	119023.279	Degrees of freedom:	85
R-squared:	0.344	Rbar-squared:	0.290
Residual SS:	78079.607	Std error of est:	30.308
F(7,85):	6.368	Probability of F:	0.000
Durbin-Watson:	2.028		

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	-9.626735	48.941007	-0.196701	0.845	---	---
Pop'l	-0.000037	0.000040	-0.941007	0.349	-0.089686	-0.238123
Area	-0.005056	0.001905	-2.654625	0.009	-0.259662	-0.264237
CIF/FOB	34.774436	40.710779	0.854183	0.395	0.088169	-0.071063
oil exp.	-17.103676	9.005648	-1.899217	0.061	-0.184784	-0.012559
ind mkt	-34.893366	13.165815	-2.650301	0.010	-0.376979	0.090860
GDPpcap	0.013885	0.003512	3.952972	0.000	1.493805	0.337832
GDPpc^2	-0.000001	0.000000	-2.277301	0.025	-0.791447	0.268407

Manufacturing

Valid cases:	93	Dependent variable:	X+M/GDP
Missing cases:	0	Deletion method:	None
Total SS:	44585.134	Degrees of freedom:	85
R-squared:	0.448	Rbar-squared:	0.403
Residual SS:	24595.228	Std error of est:	17.010
F(7,85):	9.869	Probability of F:	0.000
Durbin-Watson:	1.788		

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	-4.372820	27.468157	-0.159196	0.874	---	---
Pop'l	-0.000010	0.000022	-0.466919	0.642	-0.040809	-0.187147
Area	-0.003091	0.001069	-2.891667	0.005	-0.259376	-0.215885
CIF/FOB	12.934160	22.848939	0.566073	0.573	0.053582	-0.168468
oil exp.	-17.930357	5.054423	-3.547459	0.001	-0.316507	-0.143371
ind mkt	-17.829487	7.389318	-2.412873	0.018	-0.314727	0.239050
GDPpcap	0.009935	0.001971	5.039561	0.000	1.746387	0.440099
GDPpc^2	-0.000000	0.000000	-3.095470	0.003	-0.986519	0.349693

Agriculture

Valid cases:	93	Dependent variable:	X+M/GDP
Missing cases:	0	Deletion method:	None
Total SS:	5379.476	Degrees of freedom:	85
R-squared:	0.270	Rbar-squared:	0.209
Residual SS:	3929.705	Std error of est:	6.799
F(7,85):	4.480	Probability of F:	0.000
Durbin-Watson:	2.094		

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	-3.052778	10.979538	-0.278043	0.782	---	---
Pop'l	-0.000017	0.000009	-1.916292	0.059	-0.192730	-0.279977
Area	-0.000726	0.000427	-1.699823	0.093	-0.175455	-0.284209
CIF/FOB	14.005767	9.133149	1.533509	0.129	0.167036	0.227620
oil exp.	-6.694073	2.020348	-3.313328	0.001	-0.340181	-0.330715
ind mkt	-1.579579	2.953649	-0.534789	0.594	-0.080271	-0.125971
GDPpcap	0.000733	0.000788	0.930473	0.355	0.371049	-0.195024
GDPpc^2	-0.000000	0.000000	-0.986000	0.327	-0.361606	-0.214052

Resources

Valid cases:	93	Dependent variable:	X+M/GDP
Missing cases:	0	Deletion method:	None
Total SS:	19226.018	Degrees of freedom:	85
R-squared:	0.294	Rbar-squared:	0.236
Residual SS:	13568.731	Std error of est:	12.635
F(7,85):	5.063	Probability of F:	0.000
Durbin-Watson:	2.174		

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	-2.710863	20.402045	-0.132872	0.895	---	---
Pop'l	-0.000009	0.000017	-0.547701	0.585	-0.054144	-0.147106
Area	-0.001146	0.000794	-1.442879	0.153	-0.146388	-0.166933
CIF/FOB	7.821677	16.971109	0.460882	0.646	0.049343	-0.031690
oil exp.	8.724629	3.754186	2.323974	0.023	0.234527	0.383038
ind mkt	-14.506988	5.488435	-2.643192	0.010	-0.389962	-0.081075
GDPpcap	0.002836	0.001464	1.936523	0.056	0.759041	0.254242
GDPpc^2	-0.000000	0.000000	-0.603518	0.548	-0.217552	0.234498

Appendix 2: Import penetration regression results.

Full sample, levels, Total imports.

Valid cases:	72	Dependent variable:	Import pen.
Missing cases:	0	Deletion method:	None
Total SS:	49328.162	Degrees of freedom:	63
R-squared:	0.387	Rbar-squared:	0.310
Residual SS:	30216.635	Std error of est:	21.900
F(8,63):	4.981	Probability of F:	0.000

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	31.178001	8.339815	3.738453	0.000	---	---
NTB cvge	0.043113	0.085908	0.501849	0.618	0.058061	-0.222703
Trfs	-0.349818	0.177352	-1.972450	0.053	-0.290207	-0.365348
Pop'l	0.042572	0.038267	1.112482	0.270	0.150722	-0.196547
Area	-4.639556	2.536318	-1.829249	0.072	-0.210459	-0.320272
CIF/FOB	0.091081	2.466081	0.036934	0.971	0.003663	-0.020303
GDPpcap	0.956995	0.213665	4.478948	0.000	1.373635	0.274897
GDPpc^2	-44.981779	11.134051	-4.040019	0.000	-1.118418	0.117915
oil exp.	-17.467279	7.118460	-2.453800	0.017	-0.268965	-0.037736

Full sample, levels, Manufacturing imports

Valid cases:	72	Dependent variable:	Import pen.
Missing cases:	0	Deletion method:	None
Total SS:	14599.080	Degrees of freedom:	63
R-squared:	0.362	Rbar-squared:	0.281
Residual SS:	9310.857	Std error of est:	12.157
F(8,63):	4.473	Probability of F:	0.000

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	19.372813	4.506817	4.298557	0.000	---	---
NTB cvge	0.030141	0.045081	0.668607	0.506	0.077687	-0.191125
Trfs	-0.174812	0.093454	-1.870567	0.066	-0.284108	-0.380834
Pop'l	0.017830	0.021468	0.830568	0.409	0.116038	-0.225978
Area	-2.572742	1.409727	-1.824993	0.073	-0.214522	-0.337101
CIF/FOB	-0.329361	1.371796	-0.240095	0.811	-0.024349	-0.048839
GDPpcap	0.476050	0.117868	4.038848	0.000	1.256028	0.296639
GDPpc^2	-21.525730	6.178217	-3.484133	0.001	-0.983807	0.156355
oil exp.	-8.397505	3.945703	-2.128266	0.037	-0.255361	-0.011095

Full sample, levels, Agricultural imports

Valid cases:	72	Dependent variable:	Import pen.
Missing cases:	0	Deletion method:	None
Total SS:	1018.712	Degrees of freedom:	63
R-squared:	0.234	Rbar-squared:	0.136
Residual SS:	780.836	Std error of est:	3.521
F(8,63):	2.399	Probability of F:	0.025

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	5.252262	1.434132	3.662329	0.001	---	---
NTB cvge	0.002250	0.014253	0.157885	0.875	0.020964	-0.117922
Trfs	-0.036525	0.026287	-1.389466	0.170	-0.211760	-0.308142
Pop'l	0.002244	0.005793	0.387308	0.700	0.055273	-0.200013
Area	-0.735217	0.407603	-1.803758	0.076	-0.232075	-0.313654
CIF/FOB	0.086006	0.396688	0.216810	0.829	0.024070	0.026946
GDPpcap	0.080270	0.035261	2.276429	0.026	0.801748	0.085438
GDPpc^2	-4.345755	1.796488	-2.419027	0.018	-0.751890	-0.017130
oil exp.	-1.981227	1.156559	-1.713036	0.092	-0.228074	-0.118219

Full sample, levels, Resource imports.

Valid cases:	72	Dependent variable:	Import pen.
Missing cases:	0	Deletion method:	None
Total SS:	8551.231	Degrees of freedom:	63
R-squared:	0.302	Rbar-squared:	0.213
Residual SS:	5971.228	Std error of est:	9.736
F(8,63):	3.403	Probability of F:	0.003

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	5.816626	3.074671	1.891788	0.063	---	---
NTB cvge	-0.010107	0.031062	-0.325381	0.746	-0.039048	-0.227097
Trfs	-0.114436	0.076680	-1.492391	0.141	-0.196902	-0.210826
Pop'l	0.018229	0.015761	1.156567	0.252	0.155003	-0.103970
Area	-1.479939	1.099288	-1.346271	0.183	-0.161238	-0.210703
CIF/FOB	0.555572	1.108305	0.501281	0.618	0.053666	0.009480
GDPpcap	0.386865	0.091520	4.227127	0.000	1.333690	0.234948
GDPpc^2	-18.352759	4.881971	-3.759293	0.000	-1.095978	0.081225
oil exp.	-6.739250	3.133440	-2.150751	0.035	-0.267771	-0.032259

Appendix 3: Regression results of trade intensity regressions with price distortion and variability measures

Regression only on LDCs

Valid cases:	72	Dependent variable:	TrdShare
Missing cases:	0	Deletion method:	None
Total SS:	46996.251	Degrees of freedom:	63
R-squared:	0.316	Rbar-squared:	0.229
Residual SS:	32164.110	Std error of est:	22.595
F(8,63):	3.631	Probability of F:	0.002
Durbin-Watson:	1.839		

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	41.588648	39.479961	1.053412	0.296	---	---
Distortion	0.003527	0.069184	0.050982	0.960	0.006202	-0.187622
Variability	-50.974729	29.724495	-1.714906	0.091	-0.187167	-0.203238
pop'l	-0.000017	0.000034	-0.515258	0.608	-0.062854	-0.250998
area	-0.006805	0.002582	-2.635518	0.011	-0.315130	-0.344759
ciffob	3.851348	31.372182	0.122763	0.903	0.014105	-0.029791
GDPpcap	0.012384	0.006255	1.979869	0.052	0.720985	0.327002
GDPpcap2	-0.000001	0.000001	-1.034107	0.305	-0.351155	0.279370
oil exp	-12.490037	7.964957	-1.568124	0.122	-0.188046	-0.090754

Regression on non-oil LDCs

Valid cases:	59	Dependent variable:	TrdShare
Missing cases:	0	Deletion method:	None
Total SS:	42850.186	Degrees of freedom:	51
R-squared:	0.440	Rbar-squared:	0.363
Residual SS:	23996.999	Std error of est:	21.692
F(7,51):	5.724	Probability of F:	0.000

Variable	Estimate	Standard Error	t-value	Prob >|t|	Standardized Estimate	Cor with Dep Var
const	45.928246	40.370718	1.137662	0.261	---	---
Distortion	-0.041532	0.079941	-0.519534	0.606	-0.063604	-0.255769
Variability	-36.052877	30.196114	-1.193957	0.238	-0.130473	-0.179496
pop'l	-0.000026	0.000033	-0.783834	0.437	-0.096246	-0.234746
area	-0.005441	0.002561	-2.124251	0.039	-0.252341	-0.322810
ciffob	3.897016	31.239426	0.124747	0.901	0.014563	-0.078107
GDPpcap	0.005488	0.007904	0.694311	0.491	0.235057	0.563596
GDPpcap2	0.000001	0.000001	0.919053	0.362	0.290399	0.567842

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS540	Venture Capital Operations and Their Potential Role in LDC Markets	Silvia Sagari Gabriela Guidotti		
WPS541	Pricing Average Price Options for the 1990 Mexican and Venezuelan Recapture Clauses	Stijn Claessens Sweder van Wijnbergen	November 1990	S. King-Watson 31047
WPS542	The Metals Price Boom of 1987-89: The Role of Supply Disruptions and Stock Changes	Boum-Jong Choe	November 1990	S. Lipscomb 33718
WPS543	Development Assistance Gone Wrong: Why Support Services Have Failed to Expand Exports	Donald B. Keesing Andrew Singer	November 1990	S. Fallon 37947
WPS544	How Support Services Can Expand Manufactured Exports: New Methods of Assistance	Donald B. Keesing Andrew Singer	November 1990	S. Fallon 37947
WPS545	Health and Development: What Can Research Contribute?	Nancy Birdsall	November 1990	L. Mitchell 38589
WPS546	The Transition to Export-Led Growth in South Korea, 1954-66	Stephan Haggard Byung-Kook Kim Chung-in Moon	November 1990	E. Khine 39361
WPS547	Does High Technology Matter? An Application to United States Regional Growth	Andrea Boltho Robert King	November 1990	M. Hileman 31284
WPS548	Deposit Insurance in Developing Countries	Samuel H. Talley Ignacio Mas	November 1990	M. Pomeroy 37666
WPS549	Intertemporal Substitution in a Monetary Framework: Evidence from Chile and Mexico	Patricio Arrau	December 1990	S. King-Watson 31047
WPS550	Firms' Responses to Relative Price Changes in Côte d'Ivoire: The Implications for Export Subsidies and Devaluations	John L. Newman Victor Lavy Raoul Salomon Philippe de Vreyer	December 1990	A. Murphy 33750
WPS551	Australia's Antidumping Experience	Gary Banks	December 1990	N. Artis 37947
WPS552	Selected World Bank Poverty Studies: A Summary of Approaches, Coverage, and Findings	Nancy Gillespie	December 1990	M. Abiera 31262
WPS553	Money, Inflation, and Deficit in Egypt	Marcelo Giugale Hinh T. Dinh	December 1990	V. Israel 36097

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS554	Korea's Labor Markets Under Structural Adjustment	Dipak Mazumdar	December 1990	M. Schreier 36432
WPS555	The Macroeconomics of Price Reform in Socialist Countries: A Dynamic Framework	Simon Commander Fabrizio Coricelli	December 1990	O. del Cid 39050
WPS556	Taxing Choices in Deficit Reduction	John Baffes Anwar Shah	December 1990	A. Bhalla 37699
WPS557	The New Fiscal Federalism in Brazil	Anwar Shah	December 1990	A. Bhalla 37699
WPS558	Alternative Instruments for Smoothing the Consumption of Primary Commodity Exporters	Kenneth M. Kletzer David M. Newbery Brian D. Wright	December 1990	J. Carroll 33715
WPS559	Fiscal Policy and Private Investment in Developing Countries: Recent Evidence on Key Selected Issues	Ajay Chhibber Mansoor Dailami	December 1990	D. Bilkiss 33768
WPS560	The Persistence of Job Security in Reforming Socialist Economies	Milan Vodopivec	December 1990	CECSE 37188
WPS561	The Labor Market and the Transition of Socialist Economies	Milan Vodopivec	December 1990	CECSE 37188
WPS562	Anticipated Real Exchange-Rate Changes and the Dynamics of Investment	Luis Serven	December 1990	S. Jonnakuty 39076
WPS563	Empirical Investment Equations in Developing Countries	Martin Rama	December 1990	E. Khine 39361
WPS564	Costs and Benefits of Agricultural Price Stabilization in Brazil	Avishay Braverman Ravi Kanbur Antonio Salazar P. Brandao Jeffrey Hammer Mauro de Rezende Lopes Alexandra Tan	December 1990	C. Spooner 30464
WPS565	Issues in Socialist Economy Reform	Stanley Fischer Alan Gelb	December 1990	CECSE 37188
WPS566	Measuring Outward Orientation in Developing Countries: Can It Be Done?	Lant Pritchett	January 1991	K. Cabana 37947